# The Chemical Age

**A Weekly Journal Devoted to Industrial and Engineering Chemistry**

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## Contents

| | PAGE |
|---|---|
| EDITORIAL: The Late Dr. R. F. Ruttan; An Observer's Note on the Fair; Sulphur Independence for Canada; German Dyestuffs Propaganda | 213 |
| Debt of Science to Brewing Research | 216 |
| Causes of Spontaneous Heating of Coal | 218 |
| Society of Chemical Industry Papers | 220 |
| B.A.C. Annual Dinner | 221 |
| From Week to Week | 224 |
| Patent Literature | 225 |
| Weekly Chemical Prices and Market Reports | 228 |
| Company News | 232 |
| Commercial Intelligence | 234 |
| MONTHLY DYESTUFFS SUPPLEMENT: Fastness of Dyes to Perspiration; Diagnosis of Colour Faults in Finished Goods; Dyes and Their Application; Market Report | 15–20 |

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## The Late Dr. Ruttan

THE news of the death in Canada of Dr. R. F. Ruttan, a former president of the Society of Chemical Industry, will be received with sincere regret in this country. Dr. Ruttan succeeded Sir William Pope in the chair of the Society in 1921, and presided at the Glasgow annual meeting the following year, when he chose as the subject of his presidential address some aspects of industrial and scientific research.

It was in this field, outside his personal work as Professor of Chemistry in the McGill University, Montreal, that Dr. Ruttan's reputation principally lay. He played a very large and influential part in the organisation of national research in Canada, and his views carried weight with the Government authorities. Perhaps no term more accurately describes him than that of "chemist administrator," applied to him at a London welcome by Mr. E. V. Evans. It may be recalled that on that occasion, when it was the fashion to treat the chemical engineer rather as a joke, Dr. Ruttan emphatically associated himself with the aims of the Chemical Engineering Group, and testified to the good work that had already been done in this direction in Canada.

In some impressions of his visit that he was good enough to contribute to THE CHEMICAL AGE just before his return, Dr. Ruttan emphasised the duty of chemists to take a larger share in public life. "We chemists," he told us, "are too much inclined to shut ourselves up in our own interests, whether academical or commercial. The chemist does not, either here or in Canada, fill the place of influence and leadership in his community to which his qualifications entitle him." Another suggestion was that, in order to enliven the annual meeting of the Society, the President's address might be thrown open for a morning's discussion. There was something agreeably big and simple about Dr. Ruttan, and his brief official visit in 1922 enabled those who had the pleasure of meeting him to understand the respect and affection in which he was held in Canada.

## An Observer's Note on the Fair

AN observer who was in close touch with the Chemical Section at the British Industries Fair sums up the effect in two words, "general satisfaction." Olympia he describes with feeling as "a haven of comfort after the White City." Space was, however, limited, being 25 per cent. less than that occupied last year. Consequently sections were smaller and gangways narrower. Though rather smaller than usual, the Chemical Section was an attractive display. Its position in the annexe prevented its use as a passage way by the vast crowds to whom the products of the industry could never make any appeal; thus, those interested in the section were able to make their inspection in comparative peace and comfort, as compared with the more popular parts of the Fair.

Business, it is satisfactory to hear, was much better than last year. As usual, the majority of contacts were in the nature of inquiries rather than orders, which are rarely placed at the actual exhibition. The number of new inquiries was very encouraging, while the proportion of old customers who came up specially to renew acquaintance was another marked feature. The main criticism seemed to be the dearth of foreign visitors, for whose benefit the Fair is held. The explanation of this may be found in the unattractive conditions at the White City in past years rather than in lack of publicity and advertisement by the Department of Overseas Trade.

A feature that is rapidly becoming an important adjunct of the Chemical Section is the scheme of educational visits for parties of undergraduates and chemical students organised by the Association of British Chemical Manufacturers with the support of the Department of Overseas Trade, as an attempt to bring together chemical manufacturers and the future users of their products. Though the scheme is only in its second year, the applications were so numerous that many

could not be fitted in, even though the whole of the morning of every day, except the first, was given over to these visits. The letters of appreciation from the colleges leave no doubt that these visits are of great value and will, in due course, bear good fruit.

## Sulphur Independence for Canada

CANADA, according to information received from the Dominion Department of Mines at Ottawa, may shortly become independent of Louisiana and Texas for supplies of sulphur required in the production of sulphur dioxide gas and sulphuric acid, if the new method of burning pyrites now being developed at the plant of the Canada Power and Paper Co. at Three Rivers, P.Q., is the success it is hoped it may be. This method will utilise the sulphur contained in the large quantities of pyrites which up to now have been discarded as a waste product from the flotation treatment of the base-metal sulphide ores. The method is described as "not only new but unique." Its basis is a new form of burner which has been developed by Mr. Horace Freeman, of Shawinigan Falls. It is claimed that this new burner has practically solved the problem of producing from pyrites a grade of gas suitable for use by pulp and paper manufacturers and in sulphuric acid plants. Most of Canada's base-metal sulphide ores contain a high percentage of pyrites which has to be separated from them in producing a high-grade concentrate of the more valuable minerals. By making a selective float of the tailings a pyrites concentrate is obtained containing 48 % to 50 % sulphur. It is in the commercial use of such a concentrate that Mr. Freeman hopes to show an additional profit to the mining company whose ores contain barren pyrites and a saving to the pulp company in the production of cheaper sulphur dioxide gas.

The chief feature claimed for the new burner is its "all-round efficiency." The difficulty hitherto encountered in the low combustibility of the pyrites fines has been entirely overcome. The pyrites is conveyed by suction, dried, and burnt in suspension as a powdered fuel. The sulphur dioxide is, upon leaving the furnace, treated and washed to free it from all dust and sulphur trioxide before entering the limestone towers for the production of digestor liquors. By sintering the iron oxide resulting from the pyrites-burning, a marketable iron product is obtained which can be utilised in the iron blast furnace. The heat generated in the burning is recovered in the form of high-pressure steam, the utilisation of which more than pays for all operating costs. Installation costs are lower than with the present sulphur dioxide gas, and operating costs are no greater, as it entails no more labour and attention than the present method. The floor space required is about the same for both plants. The Canada Power and Paper Co. has already built at the St. Maurice plant a commercial size unit having a rated capacity of twenty tons of pyrites a day.

Increasing quantities of fine pyrites will be made available with the rapidly broadening application of flotation to the treatment of sulphide ores. Large deposits of such ores are now being developed all over Canada, and the successful economic utilisation of the pyrites would not only provide the pulp companies with a cheap source of sulphur dioxide gas, but would have the far-reaching effect of rendering profitable the working of a number of properties which otherwise might have little hope of paying a dividend.

## German Dyestuffs Propaganda

ATTENTION is drawn to some important notes by our Lancashire Dyestuffs correspondent (which appear in this week's *Dyestuffs Supplement*) on the possibility of a German campaign in this country in the event of the discontinuance of the Dyestuffs Act at the end of this year. The German organisation has popularised the use of the term "Indanthren" as indicating the "fastest possible" standard of colour, and the possibility of the introduction in this country of a similar German "ticket" may have considerable influence on British dyestuff manufacturers' methods.

## The Calendar

| Mar. | | |
|---|---|---|
| 10 | Ceramic Society. "W.D. Circular Tunnel Kiln." Mr. A. N. Tarrant. 7.30 p.m. | North Staffs Technical College, Stoke-on-Trent. |
| 10 | Institute of Metals (Scottish Section): Annual General Meeting. 7.30 p.m. | 39, Elmbank Crescent, Glasgow. |
| 11 | Institute of Chemistry (Huddersfield Section): "Corrosion and Heat-resisting Steels." W. H. Hatfield. 7.30 p.m. | Huddersfield. |
| 11 | Leicester Literary and Philosophical Society: "The Profession of Chemistry." R. L. Collett. 8 p.m. | Museum, Princess Road, Leicester. |
| 11 | Institution of Petroleum Technologists. 5.30 p.m. | John Street, Adelphi, London. |
| 12 | Institute of Metals Annual Meeting followed by annual dinner and dance. | Hotel Metropole, London. |
| 12 | Society of Chemical Industry (Newcastle Section): "Some New Aspects of Evaporation." J. Arthur Reavell. 7.30 p.m. | Armstrong College, Newcastle-on-Tyne. |
| 12 | Society of Dyers and Colourists (Midlands Section): "Dyeing of Pure Silk Hosiery." H. D. Mudford. 7.30 p.m. | University College, Nottingham. |
| 12 | Institute of Metals (Swansea Section): "Electric Heat-Treatment Furnaces." A. Glynne Lobley. 7 p.m. | Thomas's Café, High Street, Swansea. |
| 12 | Institute of Fuel: "Smoke Prevention and its Problems." Professor W. E. Gibbs. 6 p.m. | Burlington House, Piccadilly, London. |
| 13 | Society of Chemical Industry (Liverpool Section): Joint meeting with the Liverpool and N.W. Section of the Institute of Chemistry. Address by Dr. G. Roche Lynch. 6 p.m. | University, Liverpool. |
| 14 | Institute of Metals (Sheffield Section): "Electric Heat-Treatment Furnaces." A. Glynne Lobley. 7.30 p.m. | University, Sheffield. |
| 14 | Society of Chemical Industry (Glasgow Section): Smoker—jointly with all the Chemical Societies of Glasgow. Annual Business Meeting. | Grosvenor Restaurant, Glasgow. |
| 14 | Oil and Colour Chemists' Association: "The Protection of Ironwork on Buildings." 7.30 p.m. | 30, Russell Square, London. |
| 14 | Oil and Colour Chemists' Association (Manchester Section): "Colours Used in the Rubber Industry." G. F. Thompson. | Milton Hall, Deansgate, Manchester. |
| 15 | Royal Institution: "Atom Nuclei and their Structure." Sir Ernest Rutherford. 3 p.m. | 21, Albemarle Street, London. |
| 24 | Society of Chemical Industry (Yorkshire Section). Annual meeting. | Leeds University. |
| 27 | Chemical Society's Annual Dinner. 7.30 p.m. | Hotel Victoria, London. |

# The Late Dr. R. F. Ruttan

*A sketch specially drawn for "The Chemical Age" during the annual meeting of the Society of Chemical Industry in Glasgow, at which Dr. Ruttan presided and delivered his presidential address on some aspects of scientific and industrial research.*

# The Debt of Science to Brewing Research

## Chemical Study of Fermentation Problems

*Mr. Arthur R. Ling, M.Sc., F.I.C., Professor of Malting and Brewing and of the Biochemistry of Fermentation in the University of Birmingham, in a lecture before the Royal Society of Arts on Wednesday evening, reviewed in detail the important advances made in chemical science through research into brewing operations and especially through the study of fermentation problems. Further research, he predicted, would produce a rich harvest of results, though, he added, the number of problems awaiting solution is limitless. Sir W. W. Butler presided at the lecture.*

BREWING is an industry of great antiquity, and like other industries it was at first an empirical art, its sole guidance throughout the ages being the experience handed down from generation to generation. Indeed, systematised knowledge, which we know as science, as applied to brewing, was unknown 60 years ago, and even since then what has passed as science has often been shrouded in superstition. In every phase of his numerous operations the brewer finds himself closely connected with living processes—in the barley field, in the malt house, and in the brewery. The various changes occurring during the life of an organism known as metabolism are the result of the activity of those agents still denoted ferments, but more usually referred to as enzymes. Our knowledge of these agents and of the changes which they induce has been gathered more from the work of those who have studied the fermentation industries than from any other source.

### Three Epochs

We may divide the history of alcoholic fermentation into three epochs. The first is that in which chemistry was the dominant factor, the second is that in which biology held the sway, and the third is really a union of the first two and may be described as the biochemical epoch.

The chemical epoch commenced with the theory of fermentation propounded by Liebig in 1839; it had much in common with that enunciated by Stahl a hundred years earlier. It postulated a ferment as a substance in a kinetic state capable of imparting motion to the substrate with which it was in contact, and hence decomposition of the latter ensued. Yeast was examined under the microscope for the first time by Leeuwenhock in 1680, who recognised its cellular structure. The biological epoch of alcoholic fermentation commenced with the work of Schwann (1836–37) who showed experimentally that the phenomenon was due to the presence of living organisms. The vitalistic theory of fermentation was however finally established by the brilliant work of Pasteur in the early 60's of the last century. Pasteur states that during his work he had constantly sought in vain for a ferment (enzyme) which could act independently of yeast in its living state. It was the discovery of such an enzyme by E. Buchner in 1897 that marks the biochemical epoch. Buchner, by submitting yeast to a pressure of something like 10 tons to the square inch, succeeded in expressing a liquid which was rendered free from living cells by filtration through a Pasteur-Chamberland filter. This liquid contained the active enzyme (zymase) capable of converting sugar into carbon dioxide and alcohol. Buchner's discovery thus united the chemical theory of Liebig in its latest form and the vitalistic theory of Pasteur.

The brewer was one of the first to harness an enzyme to his service. Even at the present time the problem of the true nature of an enzyme is far from settled. So far as our knowledge extends it is a substance or mixture of substances capable of inducing a reaction by its presence without itself undergoing any change. In other words it is a catalyser analogous to those inorganic catalysers investigated by Faraday, Mitscherlich, Berzelius and others in the early years of the last century. Despite the immense amount of work carried out by Willstätter and his school, this great chemist has been forced to admit that he has not succeeded in isolating an active enzyme preparation consisting of a single chemical substance. Emil Fischer, as a result of his studies on the isomeric methyl glucosides prepared by synthetic methods, found that the α-glucoside was hydrolysed by maltase and the β-glucoside by emulsin. He was thus led to assume that a relationship exists between the structure of enzymes and substrate, that enzymes had specific properties, and combination of enzyme and substrate precedes the final change. This view, strongly supported by the work of H. E. and E. F. Armstrong, is now generally accepted. Willstätter considers that enzymes are composed of a colloidal bearer and a specific active group, which enables them to be bound to the substrate, and the composition of which at the same time conditions the colloidal nature of the entire complex. This is tantamount to the view I have long held, that an active enzyme constitutes a system rather than an individual. Such a conception enables us to understand Harden's well-known discovery that zymase of yeast may be separated into two portions by ultrafiltration, both of which are inactive, unlike the parent mixture. When they are reunited activity reappears.

### The Study of Starch

Bearing in mind the fact that starch constitutes the principal constituent of malt, it is not surprising that several of the leading scientific men connected with the brewing industry have taken up its study. The problem still awaiting solution is the structure of the starch unit, and the obvious course of attack is to ascertain the nature and quantity of the substances formed when the complex starch molecule is broken down into simpler substances which may be assumed to be the bricks of which starch itself is built. We know that when starch is treated with dilute acids under appropriate conditions, it is completely converted into glucose. This fact, however, has not so much significance for the brewer as has the nature of the products resulting from the action of the amylase (diastase) of malt (which is one of the active agents operating in the mash tun) on starch.

In 1811 Vauquelin discovered that when starch is heated somewhat strongly, it is converted into a substance resembling gum arabic in its physical properties, whilst soon afterward Kirschhoff observed that starch is converted into a crystalline sugar when it is boiled with dilute sulphuric acid, and Vogel found that in addition to sugar there is formed a gum which was named dextrin by Biot and Persoz. In 1814 Kirschhoff made the important observation that starch might be saccharified by subjecting it to the action of the vegetable albumin of grain, and that the saccharifying action of grain that had been submitted to the malting process was much more intense. Payen and Persoz in 1833 traced the saccharifying action of an infusion of malted grain to the presence of a substance which they named diastase. It had been by now well established that sugar was accompanied by the gummy substance, dextrin, when starch is submitted to the action of diastase.

So long ago as 1819 de Sausure examined the sugar resulting from the action of diastase on starch and it was more thoroughly examined by Dubronfaut in 1847, who named it maltose. In spite of this work we find in the literature that for many years afterwards malt sugar was referred to as glucose. The existence of maltose as a distinct sugar was finally established by C. O'Sullivan in 1872 and he may rightly be regarded as the rediscoverer of the sugar. O'Sullivan's further work was of great practical interest, showing as it did the influence of the mashing temperature on the nature of the products of the action of diastase on starch. The different dextrins which he isolated from the products when the reactions were allowed to proceed at different temperatures were regarded by him as non-reducing substances, although he never succeeded in isolating them quite free from reducing power. This work of O'Sullivan was of the highest practical value to the brewer, who was taught by it the importance of regulating his temperatures at different stages of the mashing process.

### Photosynthetic Results

To return to starch. This polysaccharide is formed in the chloroplasts of leaves where, in amylogenic leaves, it is, according to Sachs, the first visible product of photosynthesis. Leaf starch has the form of extremely minute granules—transitory starch—devoid of the organised structure of the granules present in stems and roots—true reserve starch. According to experiments carried out in my laboratories by R. G. L.

Beazeley, transitory starch isolated from potato leaves is readily converted into maltose when dissolved in water and treated at 50 degrees with the diastase of ungerminated barley. Transitory starch therefore consists of what I have called α-hexa-amylose.

The granules of reserve starch, on the other hand, consist of a mixture of two, in some cases three, closely related substances. So long ago as 1716 Leeuwenhock observed that by heating starch granules with water the hulls remained undissolved, and he found these hulls in the excreta of birds. The observations of C. Nägeli, Sachs, W. Nägeli, Brown and Heron, and A. Meyer in the nineteenth century all go to show that starch granules consist of more than one substance. Maquenne and Roux put forward the view that the constituent of starch granules which enables them to form a viscous paste with water is a substance to which they gave the name amylopectin. Mme. Gatin-Gruzewska has devised several physical methods of isolating amylopectin, and others have been suggested by Ling and Nanji. Amylopectin when thus isolated has the form of empty hulls. A chemical method of isolating a derivative of amylopectin has been described by Ling and Nanji. It was shown by Julian L. Baker in 1902 that when starch paste or soluble starch solution is treated with the diastase of ungerminated barley, it yields some 60 per cent. of maltose, together with a dextrin which he named α-amylodextrin. Ling and Nanji believe that this dextrin is derived from amylopectin and propose to call it αβ-hexaamylose. The original amylopectin is a phosphoric ester and αβ-hexaamylose is dephosphated and depolymerised amylopectin. The presence of a beta as well as an alpha bond can be shown by the behaviour of certain enzymes toward the dextrin. It is, moreover, the parent of the maltodextrins of one, perhaps two, trisaccharides and of the so-called isomaltose. The hydrolysis of αβ-hexaamylose by different enzymes is now being studied in my department.

### Crystalline Maltose

It was shown by Ling and Davis in 1902 that when the diastase of low dried malt is allowed to act on starch paste at 55 degrees for 95 hours, the constants are $[\alpha]_D$ 138·5 degrees and R. 96·7 degrees. The product was found to consist of crystalline maltose. Baker and Hulton have recently shown that when the diatase of ungerminated oats is allowed to act on soluble starch solutions at 50 degrees, after 2½ hours the constants of the matters in solution are $[\alpha]_D$ 135·0 degrees and R. 96·6 degrees. The product is shown to consist entirely of crystalline maltose. This result is extremely interesting and novel, but the conclusion of the authors is that they see no way of reconciling this with the theory put forward by Maquenne and Roux and elaborated by Ling and Nanji that the starch molecule consists of condensed amylose and amylopectin. Their results, they say, support the older and more simple hypothesis that starch consists of condensed maltose residues. I can only say that the evidence brought forward by Baker and Hulton is of too slender a character, and it ignores the work of Schardinger, Pringsheim, Samec, and many others. I shall have more to say on this subject when the work now in progress in my department is ready for publication.

The starch problem is one of the most controversial in biochemistry. Its apparent simplicity in reality constitutes its difficulty. The products of hydrolysis are so similar in their physical properties that their separation by fractionation with ethyl or methyl alcohol or acetone of different strengths —the only means at present available—is most unsatisfactory, and it is questionable if some of them have ever been successfully separated. At first sight the problem of dissecting the starch molecule would appear to present a much simpler problem than that of dissecting the molecule of a protein which is probably much more complex. However, the amino acids produced by the hydrolysis of a protein are much less difficult to isolate and characterise than are the products of the hydrolysis of starch.

### Scientific Training for Brewing

After referring to the great impetus given to brewing science by the establishment of the Institute of Brewing, Professor Ling continued: You will doubtless ask "If the manufacture of beer and all appertaining to it are so interlocked with science, why is it that special means are not provided for the training of those who have chosen to make brewing their career?" My answer is that such means are provided at the present time. For many years brewing schools have existed on the continent, and about 30 years ago certain progressive members of the Institute of Brewing agitated for the establishment of a brewing school in Great Britain. In 1900 the University of Birmingham was established and obtained its Charter, and I am informed that the first sum of money towards the University fund came from the Brewing Industry of the Midlands. The School was supported by subscriptions from the brewing industry, and the first director appointed was the late Professor Adrian J. Brown, who, until his death in 1919, trained a large number of those who now hold leading positions with brewing firms. Among the publications of Adrian Brown may be mentioned his discovery in 1886 that *Bacterium aceti* is able to convert mannitol into fructose, and glucose into gluconic acid. Since mannitol may be obtained from glucose by reduction, Brown's discovery was the first instance recorded of the conversion of glucose into fructose. The fact that the barleycorn contains a semipermeable layer in the neighbourhood of the testa was another notable discovery made by Brown. It was of great importance to practical malting. After the death of Professor Brown the School was endowed so that the upkeep of the Department and the emoluments of the staff were rendered independent of periodical subscriptions. In April, 1920, I was appointed to the Chair.

The recognition that brewing is a branch of science led to discussions on how the status of the practical brewer could be improved, so that he might take his place with the members of other learned professions. Numerous suggestions were made from time to time as to how this could be brought about, and the matter culminated in the foundation by the Institute of Brewing of a scheme of examinations. Another direction in which progress has been made in the science of brewing and its application to practice is the establishment of a research fund supported by the brewers throughout the country, who make annual contributions to it in sums assessed on the quantity of beer they brew annually. The scheme of research is now in active operation under the supervision of Mr. H. Lloyd Hind, who has been appointed organiser of research.

### Brewing a Branch of Science

The object in giving this brief address was not only to demonstrate that brewing is a branch of science, but also that it is one of the utmost importance to mankind in general. Apart from the fermentation industries, those remarkable agents which are the cause of all metabolic changes in life, enzymes or ferments, would certainly never have received the attention which has been given them up to the present time. We should not know as we know to-day the nature of the reactions which occur in the animal system in health and disease. Referring to brewing, Dr. Brown says in his *Reminiscences*: "In its later developments it has suggested problems which in the solving have extended the boundaries of natural knowledge beyond all expectation, and have indirectly conferred incalculable benefits on the human race. . . . The real source of this knowledge is seldom comprehended even by those whose special business it is to make daily use of it in the domain of preventive medicine, modern surgery or sanitation."

Was it not the work of Pasteur on fermentation, was it not his studies on wine, beer and vinegar which taught us the aetiology of zymotic disease? "Every unhealthy change," says Pasteur, "in the quality of beer coincides with the development of microscopic germs which are alien to the pure ferment of beer." The development of this thesis and the application of the facts elucidated by the further work of Pasteur himself, by that of Lister, of Koch and of many others, has been of inestimable service in alleviating pain, suffering and disease in the human race. The extension of our knowledge in the past by the study of fermentation will, however, surely be but little compared with what we may expect in the future, for we have at present only touched the fringe of the subject. By the further prosecution of research in brewing and allied fermentation industries we may therefore expect a rich harvest of results which will be of benefit not only to the industries concerned but also to science as a whole. The number of problems awaiting solution is limitless.

# Causes of Spontaneous Heating of Coal

## Chemical and Physical Factors

*The question of spontaneous combustion of coal and other materials on ships was brought to the notice of the Department of Scientific and Industrial Research as a subject which could usefully be investigated. After discussion with the Mercantile Marine Department of the Board of Trade, and after collecting such information as was available on the subject of fires on ships attributed to spontaneous combustion, it was arranged that an investigation should be carried out on the causes of fires occurring in coal, carried either as cargo or in the bunkers. The report on "Fires in Steamship Bunker and Cargo Coal" (H.M. Stationery Office, pp. 55, 2s.) contains the conclusions reached after an examination of the data collected during three years and dealing with 336 fires which occurred on 272 ships, together with suggestions as to the precautions desirable to prevent fires. The report shows the large majority of outbreaks of fire to be due, at least partly, to avoidable causes, and the number of fires attributed to spontaneous combustion alone is only 14 per cent. of those investigated. The general plan of the investigation, together with the questionnaire, was drawn up by Dr. F. S. Sinnatt. The investigation was carried out by Eng.-Captain J. Fraser Shaw, the chief engineer, and Dr. J. G. King, the chief chemist of the Fuel Research Station.*

## Chemical Factors

THE following statement of the nature of the phenomena associated with the spontaneous heating of coal is based upon the conclusions reached in the many researches on this subject. It is not possible to give in this paper more than a brief summary of the present position, and any reader desirous of studying the subject more fully is recommended to the information and references contained in the papers by Stopes and Wheeler(1) and Davis and Reynolds(2).

Coals, when freshly mined, or broken to expose fresh surfaces, liberate hydrocarbons—inflammable gaseous products varying in quantity and nature according to the type of the coal. W. J. Thomas* estimates the amounts of these gases per cu. ft. of coal as being from 0·5 cu. ft. for bituminous coal to 5 cu. ft. for steam coals and anthracite. The accumulation of this combustible gas in the bunkers is obviously to be avoided, and, to this end, surface ventilation is necessary.

The process of the spontaneous heating of coal, which is one of oxidation, may be considered to take place in two stages. In the first stage the oxygen is absorbed on fresh coal surfaces. The oxygen taken up from the atmosphere combines with the coal in a way not yet understood, but such an oxidation process results in the evolution of a small amount of heat, which introduces the second stage—the breakdown of the chemical "complex" which has resulted from the union of the coal and the atmospheric oxygen. Moisture and oxygen compounds of the carbon in the coal are set free from the "complex." It is now that the greater part of the heat is evolved, estimated at 90 B.Th.U. per cu. ft. of air involved. Starting at a temperature as low as 80° F. both effects continue together, the heat evolved being cumulative until a temperature is reached (about 440° F.) at which ignition of the coal follows directly. Moreover, the higher the temperature the more rapid the chemical oxidation process, and the heating effect is consequently accelerated; but, of course, the temperature cannot rise if the heat is dissipated to the surroundings more rapidly than it is developed, so that a dangerous state is attained only when the balance between generation and dissipation of heat is in favour of the former. When this is the case, the accelerated rise in the temperature ultimately reaches the danger point where the coal will take fire and continue to burn if the access of air is sufficient. The temperature at which the heat generated exceeds in amount that dissipated has been termed the "critical temperature" for the *particular* set of conditions, and has been used under *prescribed* conditions as a measure of the liability to spontaneous heating.

Owing to the variety of the influences which affect the rates of oxidation of different coals, these are best considered in separate groups.

### (a) Type of Coal

All types of coal, with the exception of anthracite, are liable to atmospheric oxidation. The liability coincides roughly with the class of coal, in that lignites are most liable and can be stored safely only under water, while other types are progressively less liable, through sub-bituminous, bituminous and semi-anthracitic coals to anthracite.

The banded constituents of bituminous coal (as classified by Stopes) are not recognised to have any distinguishing tendency to spontaneous heating. Similarly, any separation of coal into its constituents, cellulosic or resinic, has failed to disclose any fraction which is either not oxidisable or is specially liable to oxidation.

The changes occasioned in the constitution of coal by weathering, *i.e.*, slow oxidation, decrease its tendency to spontaneous heating. When slow oxidation of bituminous coal takes place at atmospheric temperature, the "ulmins" which have been formed from the original plant materials, which in the newly-won coal are insoluble in a solution of caustic soda, are converted into soluble ulmins. It is postulated by Francis and Wheeler(3) that the nucleus of the coal molecule remains the same during this change. As the carbon content of coals increases it becomes progressively more difficult for the oxygen to form these soluble ulmins, and this resistance constitutes a measure of their degree of coalification. As the first action of oxygen on coal is this change in the ulmins, Francis and Wheeler conclude that the readiness with which a given coal will oxidise and self-heat will depend upon the proportion of ulmins which it contains and their relative ease of oxidation. As the determination of the amount of ulmins in coal is a relatively simple operation(3) the above convention offers a promising method of classifying coals from the chemical point of view. It must always be remembered, however, that physical effects may entirely outweigh those occasioned by the chemical nature of the coal.

### (b) Moisture

No definite conclusion as to the influence of moisture on the oxidation of coal has yet been reached. It is considered that the inherent moisture content of a coal is an indication of its liability to oxidation, high moisture coals being the most liable; but this conclusion is, at best, vague. A reduction in tendency to oxidation by removal of moisture from a coal by drying can, it is true, be observed by laboratory methods, but the effect is probably too small to be of any practical importance.

### (c) Pyrites

The importance of the effect of pyrites has long been disputed, but it is now definitely established that direct oxidation of the coal substance is of major importance, and that the action of the pyrites is merely a supplementary, though additive, factor.

Many investigators have used the term pyrites to cover all forms of iron disulphide which occur in coal. So far as action upon the liability of coal to spontaneous combustion is concerned, this looseness of term does not matter, as any crystalline form of pyrites will oxidise in a finely divided state.

The physical condition of the pyrites is of great importance. Finely divided pyrites may oxidise rapidly owing to the rapid increase in its rate of oxidation with rise in temperature, and to its low specific heat. Such local heating undoubtedly tends to assist action taking place in the coal substance. Where pyrites occurs in lump or vein form (coal brasses) the tendency to oxidation is reduced, and pyrites in this form may be regarded as practically inactive. Theories have been advanced as to the possibility of heating being influenced by the formation of sulphuric acid by oxidation of pyrites, but this has not yet been established by experimental proof.

## Physical Factors

Although, in the main, chemical methods have been put forward for the measurement of the liability of coal to spontaneous heating, it is, nevertheless, evident that physical factors play a very important part in determining the conditions under which coals are liable to self-heating. Various

* *J. Chem. Soc.*, 1875, **13**, 793.

factors are involved, of which the most important are : Size of coal ; availability of oxygen supply, which involves also ventilation ; and the temperature to which the coal pile may rise.

### (a) Size of Coal

It is felt by many investigators that the most important factor in self-heating of coals is surface, since decrease of the size of the coal particle increases the rate of oxygen adsorption. This is only partially true, as it has been shown that the rate of adsorption is not directly proportional to the outer exposed surface of the particles.

Fine coal, nevertheless, is much more liable than coarse coal, and, as coal is generally loaded from a considerable height into the bunkers and holds of ships, the formation of fine coal and its segregation under the chute must always be expected. In this connection, it is significant that the New South Wales Royal Commission (1896–1908) (4) found that fires originated almost exclusively among the fine coal which collected under the hatchways. The best method of storing coal is to spread it uniformly in layers 2–3 ft. thick, so that the spaces between the particles of coarse coal are filled by fine coal and diffusion of air is retarded. Such a procedure is, of course, impossible in the loading of ships' bunkers or holds.

The production of fines on loading will also depend upon the friability of the coal. As a general rule, coals of high oxygen content have also a high friability. The tendency of such coals to self-heating from chemical reasons is, therefore, aggravated by this tendency to form fine dust.

Pyrites also in some cases tends to produce dust in certain coals. This action is brought about by oxidation of the pyrites in such a manner as to disintegrate the coal.

### (b) Temperature

The rate of adsorption of oxygen by coal accelerates rapidly as the temperature rises, but this increase in rate is not uniform for all coals. In general, it may be stated that the rate of reaction is approximately doubled for each 20–30° F. rise of temperature. It has been shown by Davis and Byrne (5) that the relation between time and temperature is similar for all coals, and they have attempted to deduce a zero at which spontaneous heating cannot take place. This zero they find to be about 77° F.

### (c) Accessibility of Oxygen

The accessibility of air to coal in storage must obviously play an important part, not only in the rapidity of oxidation of the coal, but in the localisation of areas in which oxidation may proceed rapidly. If no ventilation takes place, the original atmosphere retained in the voids of any pile of coal soon becomes reduced in oxygen, owing to its adsorption by the coal. This reduction in oxygen decreases the rate of oxidation of the coal, as it has been shown that the rate of oxidation varies as the square root of the oxygen percentage. Under these conditions the coal cannot self-heat to any dangerous extent.

If, on the other hand, circulation of air is so free that the heat developed by oxidation is carried off as rapidly as it is produced, storage conditions are still safe. Between these two extremes there is, however, a rate of circulation at which spontaneous heating is specially favoured. Davis and Byrne (5) have carried out experiments upon the generation of heat in unit volume of coal, in the presence of excess of oxygen, and the relation which this bears to the amount of heat which could be dissipated to surrounding coal. They find, with fine Pittsburgh coal, that the rate of generation of heat becomes equal to the maximum rate at which heat can be dissipated to the surrounding coal when a temperature of 260° F. is reached. This may be regarded as the critical temperature for this coal under the conditions of the experiment. Under normal conditions of storage, where the air supplied is cold, the critical point will be more nearly 280° F. The amount of air which is necessary to support this rate of oxidation at the crtiical temperature of 260° F. is 1·64 cu. ft., and the heat liberated is 148 B.Th.U. per hour per cu. ft. of coal. Other coals would give somewhat different values, but this serves as an illustration of the amount of ventilation which is most favourable to spontaneous heating of bituminous coals. It also illustrates the danger of small leaks having a local effect in coal bunkers. Normally, in a bunker, surface ventilation only is arranged for, and, in the absence of leaks, the coal should be safe under the conditions for no through ventilation.

### (d) Moisture

The effect of moisture in a chemical sense has already been shown to be negligible up to a condition of air-dry coal. Where moisture is present in excess of that represented by equilibrium with the atmosphere, quite a number of effects have been investigated. If the coal is thoroughly wetted the wetting tends to cause the fine coal to pack together and thereby prevents or retards the diffusion of air into the interior of the mass. Powdered coal is permeable to moisture, and the presence of excess moisture reduces the free surface of the coal exposed to oxidation.

In one set of experiments, where coal samples were dried in ovens, Parr and Kressman (6) came to the conclusion that any coal, under conditions favourable to oxidation, will be facilitated in that oxidation by the presence of excess moisture. In these experiments, however, the heat necessary to vaporise the moisture was supplied from an external source, whereas in the storage of coal the vaporisation of this moisture would have adsorbed heat. The magnitude of this effect is very much greater than that of the favouring effect found by Parr and Kressman, so that it may be concluded that, in practice, the liability of coal to spontaneous heating may be reduced by thorough wetting. The wetting must, however, be thorough, as otherwise the conditions of ventilation may be changed so as to favour the heating of coal not reached by the water. This is also the conclusion arrived at by R. Threlfall (4) in the New South Wales investigations, as a result of which an earlier Board of Trade regulation compelling captains to discharge wet cargoes was rescinded in 1908.

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## Finsbury Old Students

### Annual Election of Officers

The annual general meeting of the Finsbury Technical College Old Students' Association was held in the Engineers Club on Monday, February 24.

The following officers were elected for the coming year :— President : W. B. Esson. Vice-Presidents : E. W. Moss, H. F. Knight, H. D. Symons, E. G. Walker. Members of Council : W. J. Jeffrey, W. G. Head, Mechanical ; H. P. Guy, H. W. Gregory, electrical ; L. M. Clark, J. V. Eyre, chemical. Hon. Secretary : F. R. C. Rouse. Hon. Treasurer : W. B. Thompson. Hon. Auditors : F. B. Preston, A. J. Chapman.

It was decided to utilise the interest on the money of the Finsbury Defence Fund and the Thompson Memorial Fund for a prize to be given by the Physical and Optical Society to apprentices to commemorate the name of S. P. Thompson and Finsbury.

The annual dinner of the Association will be held at the Trocadero on Saturday, March 29th. Any old students who have not received a notice are asked to communicate with the hon. secretary, Mr. F. R. C. Rouse, 15, Clifton Gardens, Golders Green, N.W. who would be glad to receive applications from all old students as soon as possible.

# Society of Chemical Industry Papers

## Water Softening and Castor Oil Splitting

*At the meeting of the London Section of the Society of Chemical Industry, held at Burlington House, London, on Monday, two papers were presented, "Water Softening: certain properties of some base exchange materials," by A. R. Martin, and "The Splitting of Castor Oil," by H. M. Langton. Professor G. T. Morgan presided.*

Mr. Martin, whose paper gave a brief account of some experimental work now being carried out for the Rivers Pollution Research Board—only in its early stages—described experiments upon natural and synthetic base exchange materials with the object of ascertaining their general properties and reactions. Comparative figures for the synthetic and natural materials were quoted in regard to bulk densities and volumes of interstitial spaces, exchange values with varying rates of water flow and single and double regeneration. It was shown as a result of the experimental work so far carried out that synthetic materials are liable to disintegrate more quickly than natural base materials and that whilst in the case of the natural materials the reaction appears to be on the surface only, in the case of the synthetic materials the action penetrates inside the material and thus is quicker.

### Unfounded Fears

The Chairman said that one result of the work so far done was to indicate that fears that had been expressed as to the possibility of water treated in water softening plants being injurious to health were quite unfounded.

Mr. J. H. Coste said that practical experience had shown that although water softening plants were automatic in action they needed a good deal of skilled attention and there was perhaps some satisfaction that in a large works water softening plants could only be expected to work satisfactorily where there was a skilled chemist in charge or available. There seemed to be great possibilities for base exchange processes to be adopted as a finishing off process to ordinary water softening by the lime-soda process, and that was particularly so in such instances as power stations which had to take their boiler water from rivers or watercourses where there might, on occasions, be a good deal of salt water. A matter which might be investigated was the limit of usefulness of base exchange processes, as these seemed to be pre-eminently suited for domestic purposes and in other cases where cost was not important when the process was used on a small scale.

### Question of Salt Water

Dr. A. Parker, who is associated with the Rivers Pollution Research Board, said the question of salt water required to be dealt with because salt was the regenerating substance used for the spent material so that they had the rather interesting case of water which might contain lime and at the same time sodium chloride passing through the base exchange plant. Another point which was to be considered was the softening of hot water. So far as was known at present, base exchange materials were not suitable for softening hot water because they then disintegrated rapidly. The question of combining base exchange processes with the lime-soda process was extremely interesting and seemed to have many possibilities, especially in regard to boiler house operation. Another work to be undertaken was the mechanism of the reactions. At present practically nothing was known as to the mechanism properties of base exchange processes. The author had given a rough indication that in the case of natural base exchange materials there was a surface action, whilst in the case of synthetic materials there was also an internal action, but how far that was so was not yet known.

A speaker mentioned that in the case of one base exchange plant he had been concerned with the material became absolutely inert after two years, although the water was Metropolitan Water Board water and the plant had not been used as a filter.

Dr. H. E. Cox (Hon. Secretary) said he had had some experience in recommending base exchange plants for domestic use and he had found that unless great care was exercised there was the possibility of getting at various times soft water, hard water and salt water. He felt that such plants for domestic use needed to be more definitely fool-proof and it should also be arranged that the water did not alternate between hard, soft and salt.

Mr. Martin, in a brief reply to the discussion, said he could offer no explanation as to why the base exchange material referred to had become inactive after two years if, as was said, the plant had not been used as a filter.

### Qualities of Castor Oil

Mr. Langton said his paper dealt with a continuation of some work of a similar character that he dealt with in a paper which he read before the Liverpool Section seven years ago, and his only excuse for presenting it was that the results were rather interesting in view of the work of Jones on the splitting of castor oil published some 12 or 13 years ago. He had now no further opportunity for continuing the work and therefore he felt it might be desirable to place it before the Society in order to get some criticism upon it.

Castor oil was unique among the fatty oils: it was practically completely soluble in alcohol at all concentrations and only slightly soluble in petroleum ether, but it contrasted in a striking manner with other fatty oils. It had a much higher specific gravity than all the commonly known fatty oils, its viscosity was relatively high and its sodium soaps were transparent unlike the soaps of other fatty oils. Further, its outstanding chemical characteristic was its very high acetyl value, which was about 150. The characteristic properties of the oil were attributed to the presence in it of tri-glycerides and resinoleic acid. Its characteristic formula was

$$CH_3(CH_2)_5CH\,CH_2CH\,;\,CH(CH_2)_7COOH$$
$$\qquad\qquad\quad |$$
$$\qquad\qquad\quad OH$$

which was unusual because it contained an asymmetric carbon atom attached to an hydroxyl group. It was one of the few fatty acids which contained both of these. The mixed fatty acid of castor oil contained about 80 per cent. of this acid, the remainder being made up of 9 per cent. of oleic acid, 3 per cent. of linoleic acid and a small amount of hydroxy stearic.

### Behaviour Under Splitting

Though castor oil did not spontaneously polymerise even after standing for a long time, the same did not apply to the acid and Jones showed that castor oil behaved in a remarkable manner when undergoing splitting by whatever process was adopted. The usual course of the reaction in which a free fatty acid was plotted against time gave a curve of the exponential type, and when an equilibrium condition was reached, 90 to 98 per cent. of the oil was completely saponified according to the pressure and also, to some extent, to the nature of the oil. When, however, Jones tried castor oil he got the curious result that at the end of an hour, the free fatty acid was about 75 per cent., and thereafter with each succeeding hour the curve fell and ended at 9 hours with splitting, corresponding to 51 per cent. It rather seemed that after the first splitting the oil had recombined, but an examination of the autoclave product showed that it contained less than one-tenth per cent. of glycerine, indicating that saponification had been complete. Jones used a mixture of zinc oxide and zinc dust as the splitting base, to a total of 1 per cent., and the work was carried out under a steam pressure of 200 lb. per sq. inch.

In view of this it had occurred to him as to how far the high temperature at which the work was carried out had any bearing on the results obtained, and a few years ago he carried out some experiments at Hull on some 40 or 50 samples of castor oil which were saponified on a commercial scale. In these experiments he obtained a curve of the exponential type. The splitting at the end of the first hour was about 41 per cent., and equilibrium was reached at the end of 6 or 7 hours, when the free acid as resinoleic acid was 75 to 76 per cent., a good deal higher than the figure obtained by Jones. Further, his own results tended to disprove the contention of Jones and they rather indicated that the polymerisation which Jones gave as the explanation of his result is not only influenced to a considerable extent by the pressure at which the operation is carried out but of course by the higher temperature involved.

A short discussion on the paper followed.

# British Association of Chemists

## Annual London Section Dinner

THE ninth annual dinner of the London Section of the British Association of Chemists was held at the Belgravia Hotel, London, on Saturday evening. Mr. W. H. Woodcock (chairman of the Section) presided and there was a good attendance.

Proposing the toast of "the British Association of Chemists," Professor J. W. Hinchley said that the Association could be said to specialise in good works. It provided practical help to the chemist which was indispensable to him in his professional life.

In the course of his response to the toast, the Chairman alluded to the many ways in which chemistry was becoming more and more closely interwoven with everyday life. Their Association, he said, had four main planks in its platform. There was first the legal aid department which did invaluable work in protecting the professional interests of members in every way. There was secondly the unemployment benefit fund which, he wished to point out, was one of insurance and contained no element of charity whatever. The third plank, the appointments bureau, increased in strength every day. The Association was called upon to fill many important appointments at high salaries, and the number of employers who used the bureau was increasing. Mr. Woodley's work in this direction had been particularly successful. The last, but not the least, plank was registration. If the chemist was to be paid a high salary there must be some guarantee of his efficiency. There was no one society which included every competent chemist in the country. A register of those competent to practise was in the Association's view the only solution of this difficulty. Progress was necessarily slow since the full co-operation of all societies was necessary, but progress was being made which he hoped and believed would result in the formation of a statutory register.

### For the Junior Members

An illustration of the need for a central headquarters was given by Professor G. T. Morgan, who proposed the toast of "The Guests and Ladies." He was, he said, the head of a department where 25 chemists were engaged and it was difficult to get them to attend any kind of meeting. The scheme was very necessary for the junior members of the profession, rather than for the top men who were able to meet together at their clubs.

Sir Arnold T. Wilson, the principal guest of the evening, referred in his reply to the scheme for the establishment of a central headquarters in London for mining, metallurgical, chemical and allied societies, and described the general advantages such a scheme was expected to provide. As to funds, he said, about £100,000 had already been definitely promised towards the scheme. Their main object was to serve the younger generation who could not afford duplicate membership and the scheme was in effect designed to rationalise the housing of scientific societies. The status and importance of the chemist in the world to-day was rapidly growing and the outlook was brighter than it had been in the past. The distinction between pure and applied chemistry, and other artificial distinctions established in the 'seventies, were being broken down. In every direction the scope of science was widening, and further progress depended on intimate co-operation. No science was sufficient unto itself.

In conclusion, Sir Arnold said that each society included in the scheme would retain its individuality, yet would be in close touch with the others. There would be no attempt on the part of any group to absorb the others; each would have its own outlook and each must be developed independently. The scheme was designed primarily to assist the younger generation, on whose shoulders in days to come would rest the burden now carried by senior men.

Mr. J. Stenhouse, vice-president of the Institute of Brewing, who also replied, said his industry was one of those that had benefited most from the knowledge of the chemist. It had its own research scheme and its own chemists in different parts of the country. Much, however, was left to be done in the future and the essence of starch itself remained a mystery.

Mr. S. R. Price (Chairman of the Council and Vice-President) proposed the toast of "The Profession," and Dr. Stephen Miall responded.

The speeches were interspersed with an enjoyable entertainment programme contributed by Miss E. Hindom (soprano), Mr. R. Tatchell (baritone), Mr. R. J. Fleet (elocutionist), Mr. J. G. Maltby (conjurer), Mr. W. J. Reid (musical monologues) and Mr. A. W. Bishop (at the piano).

Others present, besides those mentioned, included Mrs. Woodcock, Mrs. Hinchley, Mrs. Miall, Mrs. Morgan, Miss Wright, Mr. J. C. Mellersh, Mr. M. L. Walker, Mr. H. T. F. Rhodes and Mrs. Rhodes, Mr. E. R. Redgrove and Mrs. Redgrove, Mr. T. McLachlan and Miss McLachlan, Mr. J. W. Reid, Miss F. Walker, Mr. H. M. Morgan, Mr. H. G. Turley, Mr. J. F. C. Handy, Mr. J. Bristowe P. Harrison (Vice President), Mrs. Harrison, Mr. W. Johnson and Mrs. Johnson, Mr. H. L. Howard and Mrs. Howard, Mr. A. W. Long and Mrs. Long, Dr. W. R. Harris (Hon. Secretary, London Section), Mr. V. H. Gilbert, Mr. F. B. Windle, Dr. P. Haas, Miss G. Hindes, Mr. J. W. Thom, Mr. D. T. Phillips, Mr. A. Boothroyd, Mr. W. S. Lloyd-Willey, Mrs. Lloyd-Willey, Miss Lloyd-Willey, Mr. J. A. F. Sexton, Mr. A. J. C. Cosbie and Mrs. Cosbie, Mr. A. J. Baker and Mrs. Baker, Mr. L. A. White, Mr. A. Kagan, Miss Jordan, Mr. J. H. Billson, Mr. V. M. Weall and Mr. C. B. Woodley (General Secretary).

# Industry's "Human Material"

## Huge Annual Loss through Sickness

REMARKABLE figures of the time lost to industry through sickness were quoted by the Duke of York, who presided at a dinner held at the Hotel Victoria, London, on Wednesday, February 26, to mark the completion of eleven years' work by the Industrial Welfare Society. He recalled Sir George Newman's estimate that the time lost to industry in a single year through sickness is equal to twelve months' work of nearly 590,000 persons. One well-known company, over a period of twelve months, paid in salaries during sickness no less than £199,000.

The Duke, who has been President of the Society for the past ten years, said that in making its appeal, it has always borne two things in mind. One, that there is no hope of industrial advancement unless it is founded upon a true estimation of human values; the other, that the individual workshop must be the theatre of operation.

"Our main purpose, as I see it, is to remind both masters and men that relationships in industry are, first of all, human and social. We have not thought of our work in general or remote terms. The factory itself is always the beginning and end; for, while national prosperity may be created by national effort, the burden of its maintenance rests upon the directors of each undertaking. The presence this evening of so representative a gathering is but an indication of the approval given to our policy. Great strides have been made in post-war years in industrial relationships and factory efficiency. In much of this the Society has played a part of which I am very proud."

A vital thing in the establishment of the "team spirit" in a factory was that the working force should not be subject to great or frequent changes, and the endeavour of the good employer was to keep this labour turnover as low as possible. "I know of cases," he added, "where this is as high as thirty per cent. to forty per cent. per annum of the working force, and of others where, because an enlightened policy prevails, it is negligible. How can we hope to compete in world markets while these evils remain?"

We really could not afford nowadays to treat with such indifference what the Prime Minister called "our human material." In the long run the welfare of the worker led to the welfare of the industry and to the welfare of the country as a whole. In concluding, the Duke appealed to those works that were not yet linked up with the Society to make a close investigation of its work and avail themselves of its fund of information and experience, advice and suggestion.

The Archbishop of Canterbury, who proposed the toast of "The Society," said it was very hard in these days of specialised labour for a man to think of himself as anything but a mere fragment of the wheel of a machine. This movement aimed at putting a man's heart into his job, for in the end efficiency depended on the man more than on the organisation or the machines.

Other speakers included Major J. J. Astor, M.P., the Rev. Robert Hyde, Director of the Society, Mr. Frank Hodges, and Miss Edith Picton-Turbervill, M.P. Over 400 industrialists from all parts of the country were included in the gathering.

# Brickmaking Improvements

### Machinery Displacing Skilled Workers

THE third lecture under the Cantor Bequest was delivered on Monday in the Lecture Hall of the Royal Society of Arts, London, by Mr. Alfred B. Searle, a well-known authority on clays and clay products. It dealt mainly with the manufacture of bricks from non-plastic materials, such as sand, slag, destructor refuse, colliery waste, concrete, silica rock, magnesite, zirconia and sillimanite and with the development of the brick industry as a whole.

The manufacture of bricks made from materials other than clay because of their abundance or because of some special properties which they possess, he said, has increased greatly in recent years. An enormous number of houses and other buildings have been erected on the Continent and in this country in which the chief material used was bricks made of sand, the particles being united by a small proportion of lime. Such bricks, when passed through a hardening chamber heated by steam under pressure attain in a few hours, a strength equal to that of most building bricks. They are no cheaper to produce in localities where sand, clay and fuel are equally available, but in localities where clay is scarce and sand abundant their production is profitable.

### Use of Slag and Clinker

The use of blast-furnace slag, destructor refuse (clinker) and similar materials for brick and slab-making is profitable in localities where tipping is costly and several corporations and large firms produce large quantities of such bricks annually, especially where good clay bricks are expensive. All these bricks are accurate in shape, uniform in size and of a pleasing grey or white colour according to the material used. Red bricks can be made by adding any appropriate pigment, but the grey and the white bricks are the more popular. A novel process for making bricks from the spoil banks or tips of collieries was also described. This material requires special treatment on account of its irregular composition, and a Rod-mill of recent design is found to overcome most of the difficulties which, for many years, have prevented good bricks from being made profitably.

For out-of-the-way localities, where the cost of carriage on bricks would be excessive, the use of bricks or larger-blocks made of concrete is often to be recommended. Machines for making bricks of concrete in small or large numbers are now available and some of these were described with lantern illustrations. The great increase in the knowledge of and the applicability of silica bricks used for coke ovens and other furnaces, due to intensive scientific research, was described and the effect of some of the results of these investigations on the manufacture of the bricks and on their behaviour when in use were explained. The causes of many defects in manufacture and use were almost unknown until, within the last ten years or so, definite investigations were made of the behaviour of silica in various forms under different conditions and the results have been highly instructive and valuable.

The rapid development in the use of some so-called rare minerals such as sillimanite and zirconia was also described. The value of bricks made of these materials in some industries using furnaces at very high temperatures—as for making glass, melting steel and other alloys—is being increasingly appreciated.

### Further Improvements

The prospective improvements in the brickmaking industry suggested by the lecturer were numerous ; they involve a more detailed examination of the materials used, both in the raw state and in various stages of manufacture and use, the greater employment of pyrometers and draught-gauges to ensure better control of the kilns in which the bricks are burned, devices for recording the time the machines are actually at work and for the general rendering of the machinery and kilns more automatic and fool-proof than at present. With the growing difficulty experienced in obtaining men having the requisite ability, skill and temperament, it is becoming increasingly necessary to design and employ machines in which a minimum of skill is required. For this reason, the whole trend of the industry is towards an increased " mechanisation."

The subject of rationalisation, the application of psychology to secure better conditions for the diminishing number of workers employed as well as to increase their individual usefulness were also considered and it was shown that the future success of the industry will depend on wise and enterprising development based on accurate scientific, engineering and market research. The profitable manufacture of bricks is an industry involving the application of complex chemical and physical reactions at all temperatures from zero to a white heat, on an enormous scale and within a margin which leaves extremely little room for serious errors.

# Imperial Chemical Industries

### Dissenting Brunner Mond Shareholders

A PETITION by Imperial Chemical Industries, Ltd., following upon the scheme for the transfer of the shares of Brunner, Mond and Co., Ltd., to the petitioning company was down for hearing by Mr. Justice Luxmoore in the Chancery Division on Tuesday, but an application was made for its postponement.

Imperial Chemical Industries by their petition sought to obtain authority to give notice to those shareholders of Brunner, Mond and Co. who had dissented from or not assented to the merger scheme that the petitioning company desired to acquire their shares on the terms of the scheme and contract, with the substitution of January 1, 1930 for January 1, 1927.

Mr. Gordon Browne (instructed by Mr. W. Morris) appeared for the petitioning company, and asked that the petition might be allowed to stand over for a month because they wished to file further evidence in view of the opposition to the petition, and the opponents would have to answer that evidence. The dissentient shareholders were represented by Mr. Hart, who appeared for two preference shareholders, and by Mr. Lindon, who appeared for two ordinary shareholders.

Mr. Hart said his clients were two ladies, one of whom was a widow of limited means. The petitioners kept on piling up the evidence, and they would make his clients pay for copies of it. He asked that they should not be made to pay in the future.

His lordship : I don't think the petitioners should charge you for that.

Mr. Browne agreed and undertook that the solicitors for the dissentient shareholders should be supplied with copies of further affidavits without charge.

Mr. Hay, a dissentient from Cheshire, appeared in person, and the judge suggested that he should instruct the solicitors who were acting for the other dissentients, and that his expenses for that day should be provided for.

Mr. Browne assented and the petition stood over until April 1.

# Nitrocellulose Lacquers

### Two New Factories in Yugoslavia

ALTHOUGH the market is small, the demand for nitrocellulose lacquers in Yugoslavia has been developing. They are consumed chiefly for the finishing of automobiles, the total registration of which is about 12,000 with an annual importation of approximately 2,500 cars. There is no domestic production of nitrocellulose lacquers, all supplies being imported. Import data are not available as Government customs do not provide for a separate classification of the item.

It is reported that two plants will shortly be established in Yugoslavia for the manufacture of the product. One is to be a plant of the I.G. Farbenindustrie, located at Zagreb as a separate branch of the already existing factory, Mostar Tvornica Lakova of Zagreb. The other plant is to be established in Belgrade as a branch of the Austrian firm, Rheingold Fluegger, of Vienna. Besides an American make, popular in the trade, other foreign brands represented are the German firm, Fritz Schultz, of Leipzig, Rheingold Fluegger, Austria, and the British products prepared by Pinchin, Johnson and Co., Ltd.—U.S. Consul at Belgrade.

## Education of the Professional Chemist

### Professor Smithells on "Undigested Knowledge"

At the annual meeting of the Institute of Chemistry held at 30, Russell Square, London on Monday, Professor Arthur Smithells (President), moved the adoption of the report of the Council, and made some observations on the question of chemical training, urging in particular that the burden now put upon the student was excessive and too apt to result in undigested knowledge of what were regarded as the higher things of chemistry, with accompanying neglect of what was more simple and basic.

He referred to the successive marches of chemistry that had taken place in less than a lifetime, and the great difficulty that had resulted in adjusting the new and old claims on the curriculum. The courses had become congested and the pace too rapid. A great improvement had taken place in our schools of chemistry at home and it was to-day no longer necessary to go abroad for the latest or the best in any division of the

DR. G. O. CLAYTON

science; we were, in a way, doing too much rather than too little. He alluded at some length to the ways of teaching and work which prevailed in Bunsen's laboratory at Heidelberg as illustrating the kind of conditions under which, he believed, the early training of the chemist might be more satisfactorily conducted.

The education of the professional chemist was really an important question of the day and it called for the most careful consideration. He strongly advised all who had any responsibility in the matter to read a small book which had recently appeared under the title of *Education at the Cross Roads*. It dealt to some degree explicitly with the subject, but it had much greater importance in stating the present material problems in education with unusual clearness and perspicuity. The author, Lord Eustace Percy, late Minister of Education, offered a temperate criticism and a real constructive statesmanship in describing the educational changes which he advocated.

#### Increased Membership

The Report of the Council showed that the roll of the Institute had increased by 156 members and 20 students, that the Institute was in a sound position financially, and that the committees of the Council and local sections had been actively engaged in the interests of the profession of chemistry.

The Meldola Medal was awarded to Dr. Richard Alan Morton, of Liverpool, and the Sir Edward Frankland Medal and Prize to Mr. Bernard William Bradford.

Officers and members of the Council for the ensuing year were elected, Dr. G. O. Clayton being chosen president in succession to Professor Smithells, who has occupied the chair during the past three years.

## Chemical Matters in Parliament

### Chemical Warfare

SIR W. EDGE (House of Commons, March 3) asked the Secretary of State for Foreign Affairs what nations had accepted the protocol prohibiting chemical and bacteriological methods of warfare; what nations had expressed their intention of accepting this protocol; and what nations were still carrying on research work in this connection or were known to be equipping their forces with means for using such methods of warfare as an offensive weapon.

Mr. A. Henderson: The following countries have ratified or definitely acceded to the Convention: Australia, Austria, Belgium, Canada, China, Egypt, Finland, France, Germany, India, Italy, Liberia, New Zealand, Persia, Poland, Roumania, South Africa, Spain, Turkey, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, Venezuela and Yugoslavia. The following States have signed the Convention but have not yet ratified: Abyssinia, Brazil, Bulgaria, Chile, Czechoslovakia, Denmark, Estonia, Greece, Japan, Latvia, Lithuania, Luxemburg, Netherlands, Nicaragua, Norway, Portugal, Salvador, Siam, Sweden, Switzerland, United States of America, Uruguay. I understand that Denmark, the Netherlands and Portugal intend to ratify the Convention shortly. With regard to the last part of the question, while it is impossible to state precisely the activities of foreign nations in this connection, many nations are, I understand, continuing research work.

## Sugar Beet Factory Effluents

### Insistence on Preventive Processes

THE pollution of fresh-water fisheries by effluents from beet-sugar factories and other agents was a recurring topic at the annual meeting of the National Association of Fishery Boards in London last week.

Lord Gainford said that one fact they had already learned was that the brine in the tidal part of the river Tees had a retarding effect on the oxidation which should take place when sewage was under treatment.

Mr. H. G. Maurice, Fisheries Secretary, said that the Ministry had for some time been in negotiation with the British Road Tar Association, which had been trying to produce a harmless tar. That association had been told that if it could produce a sample which, after laboratory trials, appeared to give some prospects of success, the Ministry would carry out a road experiment. After several attempts, such a sample had now been produced, and the Ministry was endeavouring to arrange an experiment on a road scale, if possible this summer.

#### No Excuse for Sugar-beet Pollution

Referring to sugar-beet factory effluents, Mr. Maurice said that they were absolutely satisfied at the Ministry that there was no excuse for any sugar-beet factory which in future polluted a river through the discharge of its effluent. The wash-water could be used over and over again; that had been proved in more than one case. Some factories said that they could not use the process water over and over again; on that point the experts differed. But if the process water could not be used repeatedly, there was another remedy, the use of biological filters. Some factories were without the installation, but there was time for it to be procured before the next "campaign" (the annual season in which the beet is converted into sugar). The only charge which could be brought against the Ministry was that, when the Government began to subsidise beet-sugar factories in order to encourage a new industry, neither the agricultural nor the fisheries side of the Ministry foresaw the possible effect on fisheries. The mischief was done, and an Act of Parliament was passed under which the Ministry was bound to pay a subsidy of so much a ton on sugar beets.

A resolution was passed calling on the Government to ensure that in the next campaign no factory shall be allowed to operate unless it has adopted a process by which pollution is prevented.

# From Week to Week

LORD MELCHETT, it is reported from Cape Town, has stated that Imperial Chemical Industries has practically decided to establish an ammonia factory in South Africa with the object of rendering the Union independent of imported nitrates.

THE SUPPLEMENT to *The Listener* of February 26 is entirely occupied with an entertaining article on "The Ways of Chemistry," by Professor Arthur Smithells, in which he explains with admirable simplicity and clearness some of the fundamental principles of chemistry.

AMONG THE FIFTEEN CANDIDATES recommended for election as Fellows of the Royal Society are Principal C. A. Edwards, of Swansea University College, the eminent metallurgist; Dr. E. K. Rideal, of Cambridge; Dr. A. Robinson; Professor H. S. Allen; Professor G. P. Thomson and Dr. P. A. M. Dirac.

BRITISH INDUSTRIES FAIR visitors at Olympia, stated Mr. Gillett in the House of Commons, were: home buyers, 150,000, as compared with 111,000 last year; overseas buyers, 4,800, as compared with 3,700; public, 51,000, as compared with 32,000. At Birmingham all classes totalled 150,000, as against 120,000 last year.

THE SOCIETY OF DYERS AND COLOURISTS will hold its 46th annual meeting and dinner at the Hotel Metropole, Northumberland Avenue, London, on March 28. In the morning the members and their ladies have been invited by the President of the Society (Mr. Cyril Eastman) to visit the works of Eastman and Son, Acton Vale.

A SPANISH ROYAL DECREE approving regulations for the inspection and testing of apparatus and recipients containing fluids under pressure, is contained in the *Gaceta de Madrid* of January 24. The text of the Decree (in Spanish) may be seen by firms interested at the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

THE GOLD MEDAL of the Institution of Mining and Metallurgy has been awarded to Sir Thomas H. Holland, Vice-Chancellor of the University of Edinburgh, in recognition of his eminent services to geological science and to the mineral industries, and of his researches and publications upon the mineral resources of the British Empire and their relationship to national and international problems.

THEFTS OF CHEMICALS alleged to be explosives or used for making explosives, from educational institutions at Lahore, India, recently led the local authorities to post policemen in the chemistry laboratories of schools and colleges in Lahore. It is stated that sulphuric acid, nitric acid and potassium chloride were stolen from the Central Model School at night after the breaking open of several locks.

NEW TAMARUGAL NITRATE CO., LTD., in a circular to its shareholders, states that as in the case of the other manufacturers of fertilisers, the company is suffering from overproduction, in view of which, and following the policy outlined by the Association of Nitrate Producers, the local board has resolved to suspend manufacture for six months in the three oficinas that are at present working. The stoppage of manufacture, it is added, will in no way affect the company's participation in the sales made by the Nitrate Producers' Association, the company's quota remaining as at present.

IMPERIAL CHEMICAL INDUSTRIES' business policy was cited as a model for the whole country by Lord Birkenhead in urging the claims of scientific research at the annual luncheon of the British Research Association for the Woollen and Worsted Industries at Bradford on Wednesday. At an earlier period than any other great industrial association in England, he said, the I.C.I. realised the possibilities of scientific organisation upon a large scale and of the employment of research, even at great cost, to reinforce the experience of very gifted men. The result was that the organisation had thrown its roots into international soil in which competition only 15 years ago would seem to have been denied, under existing fiscal conditions, to British enterprise. Referring to the element of labour, he said that those trades here and in other countries which had taken the intelligent and the less acutely political trade unionist into their confidence had, on the whole, met with the best return. Imperial Chemical Industries had found that those confidences were valued and produced a good relationship.

MR. O. DIGBY ROBERTS, F.I.C. has changed his address from 33, Fountaine Road, Streatham, S.W.6, to "Kilve," Park Copse, Dorking, Surrey.

AT PLYMOUTH TECHNICAL COLLEGE, on Friday, February 28, an illustrated lecture on "Modern Lubrication Practice" was given by Engineer Lieut.-Commdr. H. J. Nicholson, R.N., of the Vacuum Oil Co., Ltd. Mr. G. White, head of the Civil and Mechanical Engineering Department, presided.

UNIVERSITY NEWS.—*Cambridge*.—The following appointments have been made:—F. G. Mann, Ph.D., Downing College, Lecturer in Chemistry; J. D. Cockercroft, B.A., Ph.D., St. John's College, University Demonstrator in Physics; F. B. Kipping, B.A., Ph.D., Trinity College, University Demonstrator in Chemistry.

A CATCH OF WHALES producing 202,650 barrels of oil, valued at over £836,000, is reported for the first nineteen weeks of the 1929-30 season, ended March 2, by Anglo-Norwegian Holdings, Ltd., the largest British unit in the whaling industry, for the fleets it controls. This catch represents an increase of 42,550 barrels, valued at £177,290, as compared with the figures for the same period last year.

NEW MEMBERS OF THE ROYAL INSTITUTION announced at the general meeting on Monday are Dr. F. H. Carr, Mr. R. E. Clay, Mr. H. M. Dunkerley, Mr. H. R. Fry, Professor F. L. Hopwood, Mr. A. W. Isenthal, Mr. N. C. Neill, Lady Saltoun and Miss E. Watt. The Friday Evening Discourses after Easter will commence on May 2, and the season's speakers will probably include Mr. H. E. Wimperis, Professor J. Garstang, Dr. C. M. Yonge, Mr. R. S. Whipple, Sir H. C. Harold Carpenter and Professor H. Clay.

MODERN UNIVERSITIES formed the subject of an address by the Vice-Chancellor of Liverpool University (Dr. H. J. W. Hetherington) in an address at the Royal Institution on Monday. One of their primary necessities was the more ample provision for sustained research on the part of senior workers. "I believe myself, and I do not think there can be any controversy about it," he added, "that the economic future of England, and the recovery of the heavy industries of England, is very largely dependent on the scientific research of the modern universities."

IMPORTANT FACTORY INSPECTORATE changes decided on by the Government after consideration of the recommendations made by the Departmental Committee, under the chairmanship of Sir Vivian Henderson, are: (1) Increase in the general inspection staff; (2) amalgamation of the men's and women's staffs; (3) strengthening of the technical branches (medical, engineering, electrical). The increases will be spread over a period of five years and an additional division will be formed in the South-East of England where there has been in recent years a great development of industry. The technical branches will be substantially increased, the medical staff from five to eight, the electrical staff from five to twelve, and the engineering staff from six to ten.

SULPHATE OF AMMONIA formed the subject of discussion at last meeting of the Widnes Town Council when Councillor Smith called attention to an item in the minutes of the Gas Committee relating to a payment of £342 1s. to the British Sulphate of Ammonia Federation, and asked whether that was the outcome of the contract entered into at the last meeting. After Councillor Miller had intimated that there was an agreement with the agency, Mr. Dickinson explained to the Council the method adopted. If the gasworks made 100 tons of sulphate of ammonia and put it into stock the Federation paid them £5 a ton. Then, when it was sold, say, locally, and they got £10 a ton, they had to send the difference between that and the market price for the country to the Federation. It was a case of balancing at the end of the year. Councillor Smith: It is a very bad method.

### Obituary

MR. GEORGE NEVILLE BATY, chief assistant engineer of the United Alkali Co., on Tuesday, aged 47. He joined the company in 1905.

MR. JOHN MACGILCHRIST, chief engineer at Nobel's Explosives Factory branch of the Imperial Chemical Industries at Ardeer, Stevenston, on Sunday. He joined the firm as an apprentice 41 years ago and during the war was engaged in designing explosives factories.

# Patent Literature

*The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Abstracts of Accepted Specifications

323,475. Organic Acids and Esters. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 1, 1928.

Acids and esters are produced by the action of carbon monoxide at increased temperature and pressure, on alcohols, esters, ethers or aldehydes in the presence of catalysts described in Specifications Nos. 254,819 and 320,457 (see The Chemical Age, Vol. XV, p. 163, and Vol. XXI, p. 575). The superficial area of the catalysts is increased by removing one or more of their constituents by chemical or physical means. A catalyst may be obtained from a mixture of chromium and aluminium oxides, or cerium and antimony metaphosphates by converting the aluminium and antimony wholly or partly into the volatile chlorides by means of a current of phosgene or chlorine. Alternatively, catalysts can be obtained from substances such as hydroxides containing constituents which are readily volatilised, or substances containing water, ammonia or alcohol, or acid orthophosphates which give off water when heated. Metals which form volatile carbonyls must be avoided, and the walls of the vessel must be inert to the organic acids—*e.g.*, they may be made of bronzes containing aluminium, silicon or manganese, or alloys of copper, silicon and nickel. Alternatively, the reaction vessels may be lined with chromium or silver-plated material or glass. In an example, the catalyst may be prepared by treating cerium dioxide containing antimony pentoxide with phosphoric acid at 200° C., and further heating the resulting melt until it solidifies. The product is powdered and treated with phosgene at 400° C., until most of the antimony chloride is distilled off.

323,478. Dye Mixtures. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 22, 1928.

Specification No. 314,593 (see The Chemical Age, Vol. XXI, p. 113) describes the production of dyestuffs by the action of weak alkaline agents on an amino-dibenzanthrone or on a nitro- or nitroiso-dibenzanthrone. These dyestuffs are mixed together to obtain vat dye mixtures giving direct black dyeings. The second-mentioned component of the mixture may be replaced with a dyestuff obtained by the action of hydroxylamine on dibenzanthrone, as described in Specification No. 204,241 (see The Chemical Age, Vol. IX, p. 464), or by condensation of 1 : 5-diamino-anthraquinone and 2-chloranthraquinone. Other vat dyes may be added for shading.

323,513. Organic Oxygen Compounds and Catalysts. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 1, 1928.

Organic oxygen compounds are produced by the action of carbon monoxide on alcohols, esters, ethers or aldehydes, in the presence of the catalysts mentioned in Specifications Nos. 254,819 and 320,457 (see The Chemical Age, Vol. XV, p. 163 and Vol. XXI, p. 575). In this invention, the catalysts contain, also, metal halides which are not decomposed under the reaction conditions—*e.g.*, potassium fluoride or iodide, sodium chloride or aluminium chloride. The reaction is effected at pressure of 0 to 500 atmospheres and 300° to 400° C. The reacting materials must not come into contact with metals which form carbonyls—*e.g.*, coke and graphite which contain iron cannot be used as carriers. The reaction vessel is preferably constructed of a copper alloy containing 8 to 10 per cent. of aluminium, 1·5 to 2·5 per cent. of silicon or manganese, or a copper alloy containing 6 to 13 per cent. of manganese, or a copper alloy containing 6 per cent. of silicon and 2-5 per cent. of nickel. The nickel is not converted into carbonyl under the working conditions. In an example, carbon monoxide containing 7·5 per cent. alcohol vapour and 2·5 per cent. of steam is passed, at 360° C. and 200 atmospheres pressure, over a catalyst preparing by moulding a melt of cerium dioxide and phosphoric acid, to which 10 per cent. of sodium chloride is added. The product obtained is concentrated propionic acid.

323,501. Treating Cellulose Ester Materials. British Celanese, Ltd., 22, Hanover Square, London, and G. H. Ellis, of British Celanese, Spondon, near Derby. Application date, July 31, 1928.

Materials made of, or containing, cellulose esters, are waterproofed by forming insoluble metallic soaps in the material. A solution of the metallic compound may be applied under such conditions as to cause a swelling of the cellulose derivative, or it may be applied after treatment with a swelling agent, such as acetic, formic, glycollic or lactic acids, ethyl alcohol, acetone, diacetone alcohol, or diacetin, phenol or hydroquinone, thiocyanates, cyanates, urea, urethanes, thiourea, thioureathanes, guanidine, or derivatives. Suitable metals include tin, aluminium, iron, chromium, bismuth, zinc and antimony. The waterproofing operation may be combined with dyeing, and is applicable to materials formed of cellulose formate, acetate, propionate or butyrate, also cellulose ethers such as methyl, ethyl or benzyl cellulose, or the condensation products of cellulose and glycols or other polyhydric alcohols, or the products obtained by treating alkalised cellulose with esterifying agents—*e.g.*, immunised cotton obtained by treating with *p*-toluene-sulphochloride. Several examples are given.

323,512. Vulcanisation Accelerators. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany, and W. Kropp, 7, Sadowastrasse, Elberfeld, Germany. Application date, October 3, 1928. Addition to 264,674.

Specifications No. 264,673-4 (see The Chemical Age, Vol. XVI, p. 216) describe the production for use as vulcanization accelerators of condensation products from α-β-substituted acroleins and aromatic amines. In this invention, organic or inorganic acids are used as condensing agents, preferably fatty acids containing 1-18 carbon atoms, such as formic, acetic, propionic, butyric and stearic acids. Other acids, such as hydrochloric, salicylic, cinnamic, oxalic, succinic and aromatic sulphonic, may be used. In an example, α-ethyl-β-propyl-acrolein is condensed with aniline in the presence of glacial acetic, *n*-butyric, or stearic acids, with or without benzene. Other examples describe the condensation of α-ethyl-β-propyl-acrolein with *m*- or *p*-toluidine or α-naphthylamine, in the presence of glacial acetic acid, and α-*n*-amyl-β-phenylacrolein with aniline in the presence of glacial acetic acid.

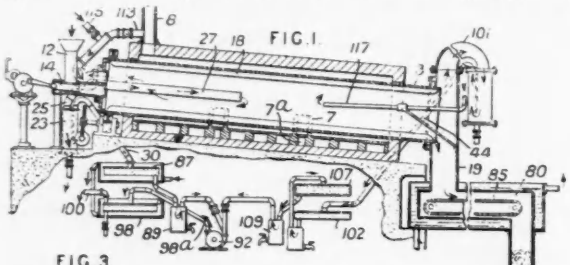
323,525. Coating Compositions. O. Y. Imray, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, August 23, 1928.

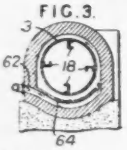
Corrosion of iron is prevented by a coating of a solution of a cellulose ether, such as benzyl cellulose and a heavy metal salt of an acid of high molecular weight, such as a higher fatty acid, naphthenic acid, or resin acid—*e.g.*, copper naphthenate, copper oleate, lead naphthenate, ferric stearate, ferric laurate or ferric resinate. In an example, benzyl cellulose is dissolved in a mixture of benzene, xylene and alcohol, and tricresyl phosphate and copper naphthenate added. Other naphthenates may be used, or, alternatively, ferric salts. The use of copper salts renders the coating suitable for coating ships' bottoms.

323,523. Low Temperature Distillation. A. E. White, London. From International Bitumenoil Corporation, 141, Broadway, New York. Application date, July 30, 1928.

Material is heated to a low temperature at the inlet end of a rotary retort, to remove moisture and lighter volatiles, and air or combustion gases may be introduced at this end. The temperature is increased towards the discharge end to expel higher-boiling volatiles and fixed gases. The material from a hopper 12 is supplied to the retort 3 by a piston 14, and is agitated in its passage by lifters 18. Burners 62 deliver

combustion products below plates 64, and different heating zones are formed by walls 7 and maintained by passing cold air through ducts 7*a*. Combustion products pass through the outlet 8, or may be diverted through valved pipe 113 and pipe 27 into the retort, while air may be added through valved pipe 115. Steam and light volatiles pass out through pipe 25




**323,523**

to a settling chamber 23, and thence by pipe 30 to condenser 87 and collecting chamber 89. Volatile products then pass to a pump 92, and condenser 98, from which fixed gases are drawn off. Steam is admitted to the retort through pipe 117, and higher boiling products are drawn off through pipes 101, 44 to condensers 102, 107. Volatile products pass on through receiver 109 and pump 92 to mix with the products from the inlet end of the retort. The residue is discharged on to an endless, water-cooled conveyor 85.

323,526. INDIARUBBER. H. E. Potts, Liverpool. From H. Plauson, 51, Hagedornstrasse, Hamburg. Application date, September 6, 1928.

Waste rubber is heated in a volatile solvent in the presence of a small amount of an organic anhydride or superoxide, or the peroxide of an alkali or alkaline earth metal, to obtain a dispersion suitable as a lacquer or a vehicle for paint. The heating is effected at 160°–180° C. in an autoclave. Colouring matter, resins, tar oil, asphalt oil, etc., may be added, and the products may be used for impregnating paper, leather, etc. The solvents employed include benzene, heavy benzines, petroleum, turpentine, tar oil, etc., and in the case of the higher boiling solvents the heating is effected under pressure of a neutral gas.

323,543. DYES. A Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 5, 1928.

1 : 1¹- or 2 : 1¹-dianthraquinonyl-aminocarbazoles containing at least one acridone ring in the 3 (CO) : 4 (NH) position and at least one acylamino group are made as described in Specification 305,082 (see THE CHEMICAL AGE, Vol. XX, p. 233) and the acid residue or residues are split off from the acylamino group or groups by heating with concentrated sulphuric acid. The conversion of a dianthraquinonylamine into the carbazole and the hydrolysis of the acylamino groups may be effected in one operation. In an example, anthraquinone-1 : 2-acridone is chlorinated with sulphuryl chloride or chlorine in nitrobenzene solution in the presence of iodine, and the trichloranthraquinone-acridone is condensed with 1-benzoylamino-5-aminoanthraquinone. The product is treated with sulphuric acid monohydrate, oleum is added to form the carbazole, and finally water is added and the mixture heated to hydrolyse the acylamino group. The product gives brown shades on cotton, changing to reddish-grey to black on exposure to air. Another example is given of the treatment of the carbazole obtained from the condensation product of trichloranthraquinone-acridone and 1-benzoylamino-4-aminoanthraquinone.

323,580. INDIARUBBER. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 18, 1928.

Natural or artificial rubber is mixed with 5–15 per cent. of resinous or asphaltic oxidation products of high molecular organic compounds such as paraffin hydrocarbons and waxes, or resinous or asphaltic conversion products of the oxidation products. The mixture is vulcanised in the usual way. A suitable product for addition to rubber is the residue obtained by distilling the acid portion, insoluble in petroleum ether, of an oxidation product of paraffin wax, and then heating to 300° C. with 3 per cent. of sulphur.

323,693. SACCHARIFICATION OF CELLULOSE. Soc. Anon. des Distilleries des Deux Sèvres, Melle, Deux-Sèvres, France. International Convention date, January 30, 1929. Addition to 311,695.

Cellulosic material is formylated with vapour of anhydrous or highly concentrated formic acid, and the cellulose ester hydrolysed with vapour of hydrated formic acid or dilute formic acid.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—295,022 (Vereinigte Stahlwerke Akt.-Ges.), relating to manufacture of iron and steel see Vol. XIX, p. 39 (Metallurgical Section) ; 295,024 (E. I. Dupont de Nemours and Co.), relating to products derived from soap-forming fatty acids, their glycerides or sulphonic acids, see Vol. XIX, p. 323 ; 299,721 (I.G. Farbenindustrie Akt.-Ges.), relating to acid wool dyestuffs, see Vol. XX, p. 13 ; 300,178 (I.G. Farbenindustrie Akt.-Ges.), relating to dyestuffs of the safranine series, see Vol. XX, p. 53 ; 300,503 (I.G. Farbenindustrie Akt.-Ges.), relating to N-oxyethyl-derivatives of nucleal substitution products and homologues of 4-amino-1-oxybenzene, see Vol. XX, p. 53 ; 305,198 (Holzverkohlungs-Industrie Akt.-Ges.), relating to catalytic hydrogenation and dehydrogenation of organic compounds, see Vol. XX, p. 360 ; 309,072 (C. H. Humphries), relating to cadmium plating, see Vol. XXI, p. 7 (Metallurgical Section) ; 309,565 (C. J. Hansen), relating to obtaining ammonium sulphate and sulphur from ammonium thio-cyanate, see Vol. XXI, p. 594 ; 310,885 (F. Krupp Akt.-Ges.), relating to an alloy of tungsten or molybdenum carbide and a lower melting metal or metalloid, see Vol. XXI, p. 7 (Metallurgical Section) ; 312,685 (E. Urbain), relating to phosphorus chlorides, see Vol. XXI, p. 114.

### Specifications Accepted with Date of Application

294,963. Artificial rubber, Manufacture of. I.G. Farbenindustrie Akt.-Ges. August 2, 1927.

297,003. Dyestuffs containing metal, Manufacture of. Soc. of Chemical Industry in Basle. September 10, 1927.

298,617. Denaturing agents for alcohol. I.G. Farbenindustrie Akt.-Ges. October 12, 1927. Addition to 298,611.

300,208. Vulcanisation of rubber. I.G. Farbenindustrie Akt.-Ges. November 8, 1927.

300,282. Liquid or solid products, Manufacture of—by gaseous reaction under the influence of silent electrical discharge. I.G. Farbenindustrie Akt.-Ges. November 11, 1927. Addition to 304,623.

300,504. Azo-dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 12, 1927.

300,563. Dehydrating vapour mixtures containing acetic anhydride and water. I.G. Farbenindustrie Akt.-Ges. November 14, 1927. Addition to 285,090.

300,965. Soluble phosphatic fertilisers from tricalcium phosphates, Manufacture of. J. A. Pond. November 21, 1927.

301,096. Azo-dyestuffs, Manufacture of. Soc. of Chemical Industry in Basle. November 24, 1927.

302,349. Splitting hydrocarbons. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. December 16, 1927.

303,123. Vat-dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. December 28, 1927.

303,138. Silica and like adsorbent gels, Manufacture of. Silica Gel Corporation. December 30, 1927.

304,280. Basic nitro derivatives of 9-aminoacridine, Manufacture of. I.G. Farbenindustrie Akt.-Ges. January 18, 1928. Addition to 283,510.

304,681. Products of acrylic acid or its derivatives, Method of preparing. Röhm und Haas Akt.-Ges. January 24, 1928.

305,047. Heat-resisting alloy. Oesterreichische Schmidt-Stahlwerke Akt.-Ges. January 28, 1928.

305,946. Cellulose ethers, Manufacture of. I.G. Farbenindustrie Akt.-Ges. February 10, 1928.

306,103. Fertilisers. Method of producing. Stockholms Superfosfat Fabriks Aktiebolag. February 15, 1928.

306,448. Mordant dyeing disazo dyestuffs. J. R. Geigy Soc. Anon. February 20, 1928.

307,708. Roasting and agglomerating fine ore or roasting residues. Soc. pour l'Enrichissement et l'Agglomeration des Minerais. March 10, 1928.
307,906. Diaryl thioureas, Preparation of. Silesia Verein Chemischer Fabriken. March 17, 1928.
312,902. Diphenyl, Manufacture of. Federal Phosphorus Co. June 2, 1928.
314,035. Mono-carboxylic acids and their derivatives, Production of. Selden Co. June 23, 1928.
314,518. *o*-*o*-diacetyl-diphenolisatine, Manufacture of. F. Hoffmann-La Roche and Co. Akt.-Ges. June 29, 1928. Addition to 221,976.
314,956. Ferri-cyanides, Production of. J. Schroter. July 5, 1928.
314,972. Conversion of ammonium thiocyanate into ammonium sulphate and sulphur. C. J. Hansen. July 6, 1928. Addition to 309,565.
325,204. Monoazo dyestuffs containing metal, Manufacture of. Soc. of Chemical Industrie in Basle. September 10, 1927.
325,208. *o*-Hydroxyazo dyestuffs and metal compounds therefrom, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) August 7, 1928.
325,222. Monoamino-dibenzopyrenequinones, Manufacture of derivatives of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) October 8, 1928.
325,224. Cellulose esters, Manufacture of. H. Dreyfus. August 13, 1928.
325,229. Yellow azo dyestuffs, Manufacture of. O. Y. Imray. (*I.G. Farbenindustrie Akt.-Ges.*) November 13, 1928.
325,231. Cellulose esters, Manufacture of. H. Dreyfus. August 13, 1928.
325,234. Catalysts for the oxidation of hydrocarbons, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 8, 1928.
325,250. Derivatives of pyranthrone, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) October 9, 1928.
325,266. Organic mercury compounds, Manufacture of. A Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 15, 1928.
325,267. Vat dyestuffs of the anthraquinone series, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 15, 1928.
325,309. Cases containing hydrogen and unsaturated hydrocarbons, Treatment of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 26, 1928.
325,315. Evaporating and recovering sulphurous acid from mixtures of hydrocarbons and sulphur dioxide, having a large excess of sulphur dioxide. Baron Marks. (*Allgemeine Ges. für Chemische Industrie.*) November 28, 1928.
325,364. Solid calcium nitrate, Production of. C. C. Smith and Imperial Chemical Industries, Ltd. January 25, 1929.
325,387. 1-halogen-2-amino-naphthalene sulphonic acids, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) February 12, 1929.
325,440. Separating aluminium chloride from other metallic chlorides. Imperial Chemical Industries, Ltd., N. Bennett, and H. Dodd. May 17, 1929.

## Applications for Patents

*[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]*

Bakelite Ges. Combination of phenol-aldehyde condensation products with air-dried fatty oils. 6,280. February 25. (Germany, February 25, 1929.)
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of artificial rubber, etc. 6,093. February 24.
—— Manufacture of black azo-dyestuffs. 6,094. February 24.
—— Manufacture of azo-dyestuffs insoluble in water. 6,575. February 27.
—— Manufacture of compounds from indene and phenols. 6,732. February 28.
—— Manufacture of cellulose ether lacquers. 6,733. February 28.
—— Manufacture of artificial hard rubber, etc. 6,750. February 28.
—— Manufacture of dinaphtho-carbazole-sulphonic acids, etc. 6,751. February 28.
Crundall, S. F. W., and P. Spence and Sons, Ltd. Preparation of calcium sulphate. 6,183. February 25.
Durand und Huguenin Akt.-Ges. Manufacture of mordant dyestuffs. 6,724. February 28. (Germany, March 1, 1929.)
Elkington, H. D., and Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Manufacture of valuable products from carbonaceous materials. 6,379. February 26.
Glebmanns, A. Device for evaporation of solvents in manufacture of acetate, etc. 6,120. February 24. (France, February , 1929.)
Horsley, G. F. Preparation of acetone from acetic acid. 6,509. February 27.
I.G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Destructive hydrogenation of coal, etc. 5,990. February 24. (September 3, 1928.)
—— Manufacture of artificial masses, etc. 6,104. February 24.
—— Illuminating tubes. 6,105. February 24.
—— Unhairing and bating hides, etc. 6,106. February 24.
—— Production of derivatives of anthracene. 6,272. February 25. (October 1, 1928.)
—— Manufacture of hydrocarbons from coal tars, etc. 6,401. February 26.
—— Manufacture of metals from metal halides. 6,531. February 27.
—— Manufacture of anhydrous aluminium chloride free from iron. 6,532. February 27.
—— Apparatus for heating, drying, and low-temperature carbonisation, etc. 6,696. February 28.
—— Manufacture of polymerisation products of diolefines. 6,697. February 28.
—— Catalytic hydrogenation of esters of aliphatic carboxylic acids. 6,843. March 1.
—— Recovery of organic compounds from mixtures. 6,844. March 1.
I.G. Farbenindustrie Akt.-Ges. Manufacture of homogeneous masses, etc. 6,071. February 24. (September 3, 1929.)
—— Production in colours of lenticular screen films. 6,396. February 26. (Germany, May 15, 1929.)
—— Manufacture of condensation products soluble in water. 6,721. February 28. (Germany, March 2, 1929.)
—— Manufacture of thyroid gland preparation. 6,722. February 28. (Germany, February 28, 1929.)
—— Manufacture of odoriferous substances. 6,723. February 28. (Germany, February 28, 1929.)
—— Manufacture of white titanium pigments. 6,768. February 28. (Germany, March 2, 1929.)
Imperial Chemical Industries, Ltd. Coating and impregnating compositions. 6,082. February 24.
Imperial Chemical Industries, Ltd., Piggott, H. A., and Rodd, E. H. Manufacture of dyes, etc., from heterocyclic compounds. 6,083, 6,084. February 24.
—— Performing endothermic gas reactions. 6,369. February 26.
—— Carrying out exothermic gas reactions. 6,370. February 26.
—— Production of hydrogen, carbon monoxide, etc. 6,381. February 26.
—— Preparation of acetone from acetic acid. 6,509. February 27.
—— Manufacture of alkali salts of organic acids. 6,510. February 27. (United States, February 28, 1929.)
Imperial Chemical Industries, Ltd. Production of non-knocking motor spirit. 6,633. February 28.
—— Treatment of benzol obtained by pyrolysis. 6,634. February 28.
Johnson, E., and Odda Smelteverk Aktiesolskal. Production of mixtures comprising ammonium nitrate. 6,114. February 24. (Norway, March 4, 1929.)
Kleijn, A., and Naamlooze Vennoostschap Chemische Industrie van Hasselt. Nitrosyl sulphuric acid. 6,549. February 27.
Neugebauer, O. Production of sugar preparations containing hydrochloric acid. 6,529. February 27.
Soc. d'Etudes Scientifiques et d'Entreprises Industrielles. Manufacture of diammonium phosphate. 6,316. February 25. (Germany, February 26, 1929.)
Triggs, W. W., and St. Joseph Lead Co. Process for making zinc sulphide. 6,123. February 24.
Victor Chemical Works. Manufacture of phosphorus compounds. 6,713. February 28. (United States, March 18, 1929.)

## South Wales By-Product Prices

SOUTH Wales by-product activities remain unchanged, business generally being slow and unsatisfactory. Pitch continues to be a quiet feature, but there have been some small forward contracts placed, chiefly for the period September, 1930, to March, 1931, at prices varying from 45s. to 47s. 6d. per ton. Current values are unchanged at from 45s. to 47s. per ton delivered. Motor benzol is in good request at from 1s. 4d. to 1s. 6d. per gallon, but creosote is slow with values unchanged at from 3d. to 4d. per gallon. Road tar has a moderate call at from 11s. to 14s. per 40-gallon barrel. Refined tars are in fair request, quotations for gasworks and coke-oven tar being unchanged. Solvent naphtha has a small demand at from 1s. 3d. to 1s. 5d. per gallon, while heavy naphtha is slow at from 11d. to 1s. 1d. per gallon. Sulphate of ammonia has a small call at approximately £10 2s. per ton. Patent fuel exports are slightly better, but prices are unchanged, being 22s. 6d. ex-ship Cardiff; and from 1s. 6d. to 2s. 6d. less ex-ship Swansea and Newport. Coke prices for furnace and foundry grades are unchanged at all South Wales ports.

# Weekly Prices of British Chemical Products

*The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.*

## General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID, CHROMIC.—1s. 0⅝d. per lb. d/d U.K.

ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° Tw.—Spot £20 to £25 per ton, makers' works according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.

AMMONIUM BICHROMATE.—8¼d. per lb. d/d U.K.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER, 35%.—Spot, £7 10s. per ton d/d station in casks, special terms for contracts.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards.

CALCIUM CHLORIDE (SOLID).—Spot, £4 15s. to £5 5s. per ton d/d in drums.

CHROMIUM OXIDE.—9¾d. and 10¼d. per lb. according to quantity d/d U.K.

CHROMOTAN.—Crystals, 3⅜d. per lb. Liquor, £8 15s. per ton d/d U.K.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4⅜d. per lb. nett d/d U.K. spot; ground ½d. per lb. extra.

POTASSIUM CHLORATE.—3⅞d. per lb., ex-wharf, London, in cwt. kegs.

POTASSIUM CHROMATE.—8¼d. per lb. d/d U.K.

SALAMMONIAC.—Firsts lump, spot, £42 10s. per ton d/d station in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE, UNGROUND.—Spot, £3 7s. 6d. per ton d/d station in bulk.

SODA ASH, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

SODA CAUSTIC, SOLID, 76/77%.—Spot, £14 10s. per ton, d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2 cwt. bags.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.

SODIUM BICHROMATE CRYSTALS.—3⅜d. per lb. nett d/d U.K. spot. Anhydrous ¾d. per lb. extra.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.r. London.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.

SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.

SODIUM SULPHIDE CONC. SOLID.—Spot, £10 5s. per ton d/d in drums. Crystals—Spot, £7 10s. per ton d/d in sellers' casks.

SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station.

## Coal Tar Products

ACID CARBOLIC CRYSTALS.—7d. to 7½d. per lb. Crude 60's, 2s. 4½d. to 2s. 5d. Jan.-June, 2s. 4d. July-Dec. per gall.

ACID CRESYLIC 99/100.—2s. 2d. to 2s. 6d. per gall. Pure, 5s. 6d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 2s. 1d. to 2s. 3d. Dark, 1s. 6d. to 1s. 10d. Refined, 2s. 7d. to 2s. 10d. per gall.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—4¾d. to 5¼d. per gall. 1100, 5½d. to 6d. per gall.; 1110, 6d. to 6½d. per gall. Unstrained (Prices only nominal).

BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall.; Pure, 1s. 10d. to 1s. 11d. per gall.

TOLUOLE.—90%, 1s. 9d. to 2s. 1d. per gall. Firm. Pure, 1s. 11d. to 2s. 5d. per gall.

XYLOL.—1s. 5d. to 1s. 10d. per gall. Pure, 1s. 8d. to 2s. 1d. per gall.

CREOSOTE.—Cresylic, 20/24%, 6¾d. to 7d. per gall.; Heavy, for Export, 6¼d. to 6¾d. per gall. Home, 4½d. per gall. d/d. Middle oil, 4½d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 1½d. to 1⅝d. per gall. ex works. Salty, 7½d. per gall.

NAPHTHA.—Crude, 8½d. to 8¾d. per gall. Solvent, 90/160, 1s. 3d. to 1s. 3½d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 6d. per gall. Solvent 90/190, 1s. to 1s. 2½d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £12 5s. per ton. Purified Crystals, £14 10s. per ton. Flaked, £14 to £15 per ton, according to districts.

PITCH.—Medium soft, 46s. to 47s. 6d. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 3s. 9d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy prices only nominal.

## Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 8½d. per lb.

ACID GAMMA.—3s. 9d. per lb. 100% d/d buyer's works.

ACID H.—2s. 3d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 6d. per lb. 100% d/d buyer's works.

ACID NEVILLE AND WINTHER.—2s. 7d. per lb. 100% d/d buyer's works.

ACID SULPHANILIC.—8½d. per lb. 100% d/d buyer's works.

ANILINE OIL.—8½d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—8½d. per lb. d/d buyer's works.

BENZALDEHYDE.—1s. 8d. per lb., packages extra, d/d buyer's works.

BENZIDINE BASE.—2s. 4d. per lb. 100% d/d buyer's works.

BENZOIC ACID.—1s. 8½d. per lb. d/d buyer's works.

*o*-CRESOL 29/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.

*m*-CRESOL 98/100%.—2s. 9d. per lb., in ton lots d/d.

*p*-CRESOL 32/34° C.—2s. per lb., in ton lots d/d.

DICHLORANILINE.—1s. 10d. per lb.

DIMETHYLANILINE.—1s. 9½d. per lb., drums extra d/d buyer's works.

DINITROBENZENE.—8d. per lb.

DINITROCHLORBENZENE.—£74 per ton d/d.

DINITROTOLUENE.—48/50° C., 7½d. per lb.; 66/68° C., 9d. per lb.

DIPHENYLAMINE.—1s. 8d. per lb. d/d buyer's works.

*a*-NAPHTHOL.—1s. 11d. per lb. d/d buyer's works.

*B*-NAPHTHOL.—£65 per ton in 1 ton lots, d/d buyer's works.

*a*-NAPHTHYLAMINE.—1s. per lb. d/d buyer's works.

*B*-NAPHTHYLAMINE.—2s. 9d. per lb. d/d buyer's works.

*o*-NITRANILINE.—5s. 11d. per lb.

*m*-NITRANILINE.—2s. 6d. per lb. d/d buyer's works.

*p*-NITRANILINE.—1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—6½d. per lb, 5-cwt. lots, drums extra, d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.

R. SALT.—2s. per lb. 100% d/d buyer's works.

SODIUM NAPHTHIONATE.—1s. 6½d. per lb. 100% d/d buyer's works.

*o*-TOLUIDINE.—8d. per lb., drums extra, d/d buyer's works.

*p*-TOLUIDINE.—1s. 9d. per lb. d/d buyer's works.

*m*-XYLIDINE ACETATE.—3s. 1d. per lb. 100%.

N. W. ACID.—4s. 9d. per lb. 100%.

## Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£78 per ton.

CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.

WOOD CREOSOTE.—1s. 9d. per gall., unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d. per gall. Solvent, 4s. to 4s. 3d. per gall.

WOOD TAR.—£3 10s. to £4 10s. per ton.

BROWN SUGAR OF LEAD.—£38 per ton.

## Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 8d. to 1s. 10d. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.

CADMIUM SULPHIDE.—5s. to 6s. per lb.

CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity.

CARBON BLACK.—4 1/16d. to 4½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 6d. per lb.

LITHOPONE, 30%.—£20 to £22 per ton.

SULPHUR.—£9 10s. to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£55 to £60 per ton.

ZINC SULPHIDE.—8d. to 11d. per lb.

## Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£37 per ton, ex wharf London, barrels free.

ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 11d. per lb., according to quantity.

ACID, BENZOIC B.P.—2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £32 per ton; powder, £36 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—1s. 10d. to 1s. 10¼d. per lb., less 5%.

ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 7d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—1s. 3½d. per lb., less 5%.

ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.

AMIDOL.—7s. 6d. to 9s. per lb., d/d.

AMIDOPYRIN.—7s. 9d. to 8s. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—9s. per oz.

BARBITONE.—5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—3s. to 3s. 3d. per lb spot.

BISMUTH CARBONATE.—8s. 9d. per lb.

BISMUTH CITRATE.—8s. 3d. per lb.

BISMUTH SALICYLATE.—8s 3d. per lb.

BISMUTH SUBNITRATE.—7s. 6d. per lb.

BISMUTH NITRATE.—Cryst. 5s. 3d. per lb.

BISMUTH OXIDE.—11s. 3d. per lb.

BISMUTH SUBCHLORIDE.—10s. 3d. per lb.

BISMUTH SUBGALLATE.—7s. 3d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.

BORAX B.P.—Crystal, £21 per ton; powder, £22 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 2s. 0d. per lb.; potassium, 1s. 8d. per lb.; granular, 1s. 5¼d. to 1s. 7¾d. per lb.; sodium, 1s. 11d. per lb. Prices for 1 cwt. lots.

CALCIUM LACTATE.—B.P., 1s. 0½d. to 1s. 3d. per lb., in 1-cwt. lots.

CAMPHOR.—Refined flowers, 3s. 3d. to 3s. 4d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.

CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.

CREOSOTE CARBONATE.—6s. per lb.

ETHERS.—S.G. ·730—11d. to 1s. per lb., according to quantity; other gravities at proportionate prices.

FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.

GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.

HEXAMINE.—2s. 3d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchesters, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.

HYDROQUINONE —3s. 9d. to 4s. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8½d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.

IRON AMMONIUM CITRATE.—B.P., 2s. 8d. to 2s. 9d. per lb. Green, 2s. 10d. to 3s. per lb. U.S.P., 2s. 7d. to 2s. 10d. per lb.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8¾d. to 9¼d. per oz., according to quantity.

MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 17s. per lb. net; Synthetic, 9s. 6d. to 11s. 9d. per lb.; Synthetic detached crystals, 9s. 6d. to 11s. per lb., according to quantity; Liquid (95%), 9s. per lb.

MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.

METHYL SULPHONAL.—18s. 6d. to 20s. per lb.

METOL.—9s. to 11s. 6d. per lb. British make.

PARAFORMALDEHYDE.—1s 9d. per lb. for 100% powder.

PARALDEHYDE.—1s. 4d. per lb.

PHENACETIN.—3s. 8½d. to 4s. 1d. per lb.

PHENAZONE.—5s. 11d. to 6s. 1½d. per lb.

PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—103s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P.C., 2s. 6d. per lb. in 28 lb. lots. Smaller quantities 1d. per lb. more.

POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins

RESORCIN.—2s. 10d. to 3s. per lb., spot.

SACCHARIN.—43s. 6d. per lb.

SALOL.—2s. 3d. to 2s. 6d. per lb.

SODIUM BENZOATE B.P.—1s. 8d. to 1s. 11d. per lb.

SODIUM CITRATE, B.P.C., 1911, AND U.S.P. VIII.—2s. 2d. per lb., B.P.C. 1923, and U.S.P. IX—2s. 6d. per lb. Prices for 28 lb. lots. Smaller quantities 1d. per lb. more.

SODIUM FERROCYANIDE.—4d. per lb., carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—100s. per cwt. Crystals, 5s. per cwt. extra.

SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. per lb. Crystal, 1s. 11d. to 2s. 1d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.

SODIUM SULPHIDE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.

SULPHONAL.—9s. 6d. to 10s. per lb.

TARTAR EMETIC, B.P.—Crystal or powder, 2s. 1d. to 2s. 3d. per lb.

THYMOL.—Puriss, 7s. 6d. to 8s. 6d. per lb., according to quantity. Firmer. Natural, 12s. per lb.

## Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—12s. per lb.

AMYL ACETATE.—2s. 6d. per lb.

AMYL BUTYRATE.—5s. per lb.

AMYL CINNAMIC ALDEHYDE.—12s. per lb.

AMYL SALICYLATE.—3s. per lb.

ANETHOL (M.P. 21/22° C.).—6s. 6d. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—2s. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—2s. per lb.

BENZYL BENZOATE.—2s. 3d. per lb.

CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.

COUMARIN.—8s. 3d. per lb.

CITRONELLOL.—10s. 6d. per lb.

CITRAL.—8s. per lb.

ETHYL CINNAMATE.—6s. 6d. per lb.

ETHYL PHTHALATE.—2s. 9d. per lb.

EUGENOL.—10s. per lb.

GERANIOL (PALMAROSA).—19s. per lb.

GERANIOL.—7s. 6d. to 10s. per lb.

HELIOTROPINE.—7s. per lb.

ISO EUGENOL.—12s. per lb.

LINALOL.—Ex Bois de Rose, 12s. per lb. Ex Shui Oil, 10s. per lb.

PHENYL ETHYL ACETATE.—11s. per lb.

PHENYL ETHYL ALCOHOL.—9s. 6d. per lb.

RHODINOL.—48s. per lb.

SAFROL.—2s. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—13s. to 15s. per lb. Ex Guaiacol, 12s. 6d. to 14s. per lb.

## Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. per lb.

ANISE OIL.—4s. 3d. per lb.

BERGAMOT OIL.—11s. 6d per lb.

BOURBON GERANIUM OIL.—16s. 6d. per lb.

CAMPHOR OIL, WHITE.—160s. per lb.

CASSIA OIL, 80/85%.—4s. 9d. per lb.

CINNAMON OIL LEAF.—7s. 9d. per oz.

CITRONELLA OIL.—Java, 2s. 8d. per lb., c.i.f. U.K. port; pure, Ceylon, 2s. 6d. per lb.

CLOVE OIL (90/92%).—7s. per lb.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 9d. per lb.

LAVENDER OIL.—Mont Blanc, 38/40%, 12s. 3d., per lb.

LEMON OIL.—6s. per lb.

LEMONGRASS OIL.—4s. per lb

ORANGE, SWEET.—12s. 9d. per lb.

# London Chemical Market

*The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

*London, March 6, 1930.*

BUSINESS has continued along quietly steady lines, with prices in the main level. There is little of outstanding importance to report, and the general tone is steadiness. There has been a considerable amount of inquiry on export account.

## General Chemicals

ACETONE.—Prices continue unchanged at £71 10s. to £80 per ton, with a fair general demand.

ACETIC ACID.—Continues active with price firm at £36 10s. for 80% technical, and £37 10s. for 80% edible.

ACID LACTIC.—In quietly steady demand at £43 per ton for 50%, by weight, pale grades.

ACID OXALIC.—Rather a larger volume of business concluded with prices very firm at £30 7s. 6d. to £32 per ton, according to quantity.

ACID TARTARIC.—In a little better demand with price unchanged at about 1s. 3½d. per lb., less 5%.

ALUMINA SULPHATE.—In active request and firm at £8 to £8 15s. per ton, for 17/18%, iron-free quality.

ARSENIC.—Still little movement in the product, with price unchanged at £16 5s. to £16 10s. per ton, free on rails at the mines.

BORAX.—Maintained at the recently advanced rates with the market firm.

CITRIC ACID.—Only in quiet request with price unchanged at 1s. 11½d. per lb., less 5%.

CREAM OF TARTAR.—Somewhat more inquiry is being received, with the market showing a slightly firmer tendency at about 102s. per cwt.

COPPER SULPHATE.—Inquiry increasing, with the price continuing steady for early delivery. Forward position indicates a slightly firmer market.

FORMALDEHYDE.—Moving in good volume with price steady at about £36 per ton.

LEAD ACETATE.—Demand has been fair, with prices a little easier at about £43 per ton for white, and brown at about £42 per ton.

LEAD NITRATE.—Unchanged, with price ruling steady at about £33 per ton.

LIME ACETATE.—Rather quieter with price inclined to be slightly easier.

LITHOPONE.—In regular demand, mainly on contract account, at £19 15s. to £23 per ton, according to quality.

POTASSIUM CARBONATE.—Continuing in good request at £27 per ton for 96/98% arsenic free.

PERMANGANATE OF POTASH.—A fair amount of attention, with price firm at 5½d. per lb. for B.P. bold needle crystals.

SODIUM ACETATE.—Unchanged at about £21 10s. to £22 per ton, with a regular demand.

SODIUM BICHROMATE.—Continues active at 3⅝d. per lb.

SODIUM HYPOSULPHITE CRYSTALS.—Commercial quality £8 10s. to £9 per ton, with photographic crystals £14 to £15 per ton, and with an improving demand.

SODIUM NITRITE.—In good request at about £20 per ton.

SODIUM PRUSSIATE.—Firm and in fair request at 4¾d. to 5¼d. per lb., according to quantity.

SODIUM SULPHIDE.—Fair amount of business passing at British makers' prices, which are firmly held.

TARTAR EMETIC.—A little better inquiry is being received and price is unchanged at 11d. per lb.

ZINC SULPHATE.—In fair request at about £13 10s. per ton.

## Coal Tar Products

The coal tar product market remains dull, although prices are still being maintained.

MOTOR BENZOL.—Unchanged at about 1s. 5½d. to 1s. 6d. per gallon f.o.r.

SOLVENT NAPHTHA.—Quoted at about 1s. 2½d. to 1s. 3d. per gallon, f.o.r.

HEAVY NAPHTHA.—Quoted at about 1s. 1d. per gallon f.o.r.

CREOSOTE OIL.—Unchanged at 3d. to 3½d. per gallon f.o.r. in the North, and at 4d. to 4½d. per gallon in London.

CRESYLIC ACID.—Quoted at 2s. per gallon for the 98 100% quality, and at 1s. 10d. per gallon, ex works, for the dark quality 95/97%.

NAPHTHALENES—Firelighter quality is quoted at £3 10s. to £3 15s. per ton, the 74/76 quality at £4 to £4 5s. per ton, and the 76/78 quality at about £5 per ton.

PITCH.—No change in the market, which remains nominally at 45s. to 47s. 6d. per ton, f.o.b. East Coast port, for early delivery.

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The following additional prices have been supplied:—

CARBOLIC ACID.—Prices are unchanged at 7d. to 7½d. per lb., according to quantity.

CRESYLIC ACID.—No change.

ACETYL SALICYLIC ACID.—Prices are 2s. 9d. to 2s. 11d. per lb., so far as this market is concerned, although Continental prices have recently advanced by 1s. per kilo.

METHYL SALICYLATE.—Quoted at 1s. 3d. to 1s. 5d. per lb., according to quantity.

## Nitrogen Fertilisers

*Sulphate of Ammonia.—Export.*—Although the demand on the Continent continues good, supplies appear to be plentiful, and the price remains at £8 3s. 6d. to £8 5s. per ton f.o.b. U.K. port, in single bags. In some quarters it is anticipated that the market will become firmer as the consuming season advances. *Home.*—Merchants report considerable buying for prompt delivery, but on account of the low prices for agricultural products, many anticipate that the quantity of fertilisers consumed will be less than last year.

*Nitrate of Soda.*—The buying of nitrate has commenced in the South, but the volume has not been great.

## Latest Oil Prices

LONDON, March 5.—LINSEED OIL was steadier for forward. Spot, ex mill, £41; March, £37 10s.; March-April, £37 10s.; May-August, £37 12s. 6d.; September-December, £37 15s., naked; RAPE OIL was dull and 10s. lower; crude extracted, £37; technical refined, £38 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £28; refined common edible, £32 10s.; deodorised, £34 10s., naked, ex mill. TURPENTINE was quiet and 6d. per cwt. lower. American, spot, 43s. 6d., paid, and sellers; March to June, 43s. 9d. sellers.

HULL.—LINSEED OIL, spot, £39 10s.; March, £38 15s.; April and May-August, £38 2s. 6d. COTTON OIL.—Egyptian crude, spot, £28; edible refined, spot, £31 5s.; technical, spot, £31; deodorised, spot, £33 5s. PALM KERNEL OIL.—Crude naked 5½ per cent., spot, £30 10s. GROUNDNUT OIL.—Crushed extracted, spot, £33 10s.; deodorised, spot, £37 10s. SOYA OIL.—Extracted and crushed, spot, £30 10s; deodorised, spot, £34. RAPE OIL.—Crushed-extracted, spot, £36 10s.; refined, spot, £38 10s. per ton, cash terms, ex mill.

## Scottish Coal Tar Products

THERE is little or nothing of interest to report this week. Markets are quiet and prices generally remain steady.

*Cresylic Acid* continues in fair demand for prompt delivery, with prices firm, as follows: Pale 99/100%, 1s. 11d. to 2s. 1d. per gallon; pale 97/99%, 1s. 9½d. to 1s. 10½d. per gallon; dark 97/99%, 2s. 8d. to 1s. 9d. per gallon; all f.o.r. works. High boiling acid remains very quiet at 1s. 9½d. to 1s. 11½d. per gallon.

*Carbolic Sixties.*—Production is small and price is nominal at 2s. 3d. to 2s. 5d. per gallon.

*Creosote Oil.*—The position is still unchanged. There is over-production at most of the distillers' works and certain grades are unsaleable at the moment. Specification oil, 3½d. to 4d.; gas works ordinary, 2⅞d. to 3⅜d.; washed oil, 3d. to 3½d.; all per gallon, free on rails makers' works in bulk quantities.

*Coal Tar Pitch* remains nominal at 47s. 6d. per ton f.a.s. Glasgow for export. Orders for home trade are less frequent and quotations are reduced to about 50s. to 52s. 6d. per ton.

*Blast Furnace Pitch.*—Controlled prices are unaltered at 30s per ton f.o.r. works for home and 35s. per ton f.a.s. Glasgow for export. Orders are very scarce.

*Refined Coal Tar.*—Inquiries for large quantities are now being received and quotations are firm at 3⅞d. to 4⅛d. per gallon, ex works naked.

*Blast Furnace Tar* is without interest at 2¾d. per gallon.

*Crude Naphtha.*—The value remains nominal at about 4⅞d. to 5⅜d. per gallon at makers' works.

*Water White Products.*—90/160 solvent naphtha and motor benzol are in fair demand at 1s. 2d. to 1s. 3d. per gallon and 1s. 6½d. to 1s. 6¾d. per gallon respectively, while 90/190 heavy solvent is quiet at 1s. to 1s. 1d. per gallon.

# Scottish Chemical Market

*The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

*Glasgow, March 5, 1930.*

THE Scottish Chemical Market during the past week has been rather more active, and good inquiry has been received for both home and export trading. There are no changes of any importance to record.

### Industrial Chemicals

ACETONE, B.G.S.—£71 10s. to £80 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID ACETIC.—This material is still scarce for immediate supply but prices remain unchanged as follows: 98/100% glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £32 per ton, packed in bags, carriage paid U.K. stations. There are a few fairly cheap offers made from the Continent.

ACID CARBOLIC, ICE CRYSTALS.—Quoted 8d. per lb. delivered.

ACID CITRIC, B.P. CRYSTALS.—Quoted 2s. per lb., less 5%, ex store, prompt delivery. Rather cheaper offers for early delivery from the Continent.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality 4s. per carboy. Dearsenicated quality, 5s. 6d. per carboy, ex works, full wagon loads.

ACID NITRIC, 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—On offer at same price, viz.: 3¼d. per lb., ex store. Offered from the Continent at 3⅛d. per lb., ex wharf.

ACID SULPHURIC.—£2 15s. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 1s. 4d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. 4⅛d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £7 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton, c.i.f. U.K. ports. Crystal meal about 2s. 6d. per ton less.

AMMONIA, ANHYDROUS.—Quoted 7½d. per lb., carriage paid. Containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Rather easier and Spot material now obtainable at round about £34 per ton, ex wharf. On offer for prompt shipment from China at £30 per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—Quoted £18 per ton, ex wharf, prompt despatch from mines. Spot material still on offer at £19 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports. For Continental material price would be £10 per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. per ton to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £35 per ton, ex store. Continental material on offer at about £34 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 5s. per ton, ex wharf.

LEAD, RED.—Price now £37 10s. per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted round about £39 to £40 per ton, ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½%, delivered.

POTASSIUM BICHROMATE.—Quoted 4⅜d. per lb. delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer at £26 10s. per ton, ex store. Offered from the Continent at £25 5s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100%.—Powder quoted £25 10s. per ton, ex wharf. Crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb., ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb., ex wharf.

SODA, CAUSTIC.—Powdered, 98/99%, £17 10s. per ton in drums, £18 15s. per ton in casks. Solid, 76/77%, £14 10s. per ton in drums, and £14 12s. 6d. per ton for 70/72% in drums, all carriage paid buyers' stations, minimum 4-ton lots, for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅞d. per lb., delivered buyers' premises with concession for contracts.

SODIUM CARBONATE. (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality 27s. 6d. per ton extra. Light soda ash £7 13s. per ton, ex quay, minimum 4-ton lots with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum 4-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum 4-ton lots. Prices for this year unchanged.

SODIUM NITRATE.—Chilean producers are now offering at £10 2s. per ton, carriage paid buyers' sidings, minimum 6-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices 55s. per ton, ex works, 57s. 6d. per ton delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption. Solid, 60/62%, £9 15s. per ton. Broken, 60/62%, £10 15s. per ton. Crystals, 30/32%, £7 17s. 6d. per ton, all delivered buyers' works on contract, minimum 4-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. 0d. per ton; ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE, 98%.—British material offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £10 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

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## "A Scientific Police Service"

### Health Minister at Public Analysts' Dinner

"PUBLIC analysts are a scientific police service going about as wolves in sheep's clothing," said Mr. Arthur Greenwood, the Minister of Health, at the annual dinner of the Society of Public Analysts and Other Analytical Chemists, at the Savoy Hotel on Tuesday. Mr. Greenwood said the public analyst was contributing far more to our public well-being than the general public understood, and that was very largely due to the high standard set by the analyst's profession, the Ministry of Health, and the local authorities. Statistics showed that adulteration of food had decreased. One difficulty was that food adulteration, which used to be of the crudest description, had become more subtle and sinister. But if statistics were true he believed that the public analyst was on top of those people who were putting science to base uses.

Lord Tomlin, toasting "The President," said the value of expert evidence depended on the fair and impartial manner in which it was given. The President (Mr. E. Hinks) replied.

Past-President E. R. Bolton gave the toast of "Kindred Societies," and acknowledgments were made by Lord Riddell and Dr. H. Levinstein. Other speakers included Past-President A. Chaston Chapman, Lieut.-Colonel Sir Arnold T. Wilson, and Sir Douglas Newton, M.P.

# Manchester Chemical Market

(From Our Own Correspondent.)

*Manchester, March 6, 1930.*

General reports as to trading conditions in chemicals on this market during the past week pretty well all describe business as being patchy and only on moderate lines so far as movements for spot and early delivery are concerned. With regard to specifications against contracts, these are circulating fairly satisfactorily considering the situation at the consuming end of the trade. On the whole values maintain their general steadiness, with a reactionary tendency in evidence here and there.

### Heavy Chemicals

A fair amount of interest is being shown in the case of bichromate of soda, offers of which keep very firm on the basis of 3⅜d. per lb., less 1 to 2½ per cent. discount, according to quantity. Caustic soda also is well held at from £12 15s. to £14 per ton and a moderately good movement of this material has been reported here during the past week. Buying interest in the case of chlorate of soda has been rather subdued, but offers in this section keep up at from £25 to £27 per ton, ex store, and according to quantity. Bicarbonate of soda is selling in fair quantities on a contract basis of £10 per ton. Sulphide of sodium is on the quiet side, with current values at round £10 per ton for the 60-65 per cent. concentrated solid quality and £8 for the commercial grade. Alkali meets with a moderate amount of inquiry and prices are steady at about £6 per ton. There is a quiet demand about in the case of phosphate of soda, with the dibasic quality obtainable at round £11 5s. per ton. With regard to hyposulphite of soda, the movement of this material has been on a somewhat restricted scale but offers are much the same as before, the commercial kind being at about £9 5s. per ton and the photographic at £15.

Caustic potash is attracting moderate attention, with current offers at from £30 10s. per ton upwards, according to quantity. Carbonate of potash is reasonably steady at round £26 5s. per ton, although only a quiet demand for this material has been experienced during the past week. Yellow prussiate of potash maintains its firmness at from 6¾d. to 7¼d. per lb., according to quantity, and a fair weight of business is being put through. Chlorate of potash continues to be quoted here at from £26 to £28 per ton but sales are on the quiet side. With regard to bichromate of potash, there is a fairly steady movement of this into consumption on the basis of 4⅜d. per lb. Permanganate of potash is rather slow but offers keep up at round 5¼d. per lb. for the commercial quality, with the B.P. still quoted at about 5½d.

### Sulphate of Copper

The demand for sulphate of copper is on moderate lines both for home use and for shipment; in spite of the vagaries of the metal there has been little change in sulphate prices, these being at up to £26 10s. per ton, f.o.b. Arsenic is in quiet demand but values are maintained at about £16 per ton at the mines for white powdered, Cornish makes. Lead products are easy in tendency and only a quiet business is passing; nitrate is on offer at down to £32 10s. per ton and white and brown acetate at £38 10s. and £38. There is a moderate demand about for the acetates of lime at £7 10s. per ton for the brown quality and £16 for the grey.

### Acids and Tar Products

Demand in the case of citric acid seems to be largely on hand-to-mouth lines, and the tendency is still easy at about 1s. 10¾d. per lb. Tartaric acid is in moderate request and prices are fairly steady at 1s. 3½d. per lb. Only a quiet business has been reported this week in the case of oxalic acid, sales of which are on the basis of £1 12s. 6d. per cwt., ex store. Acetic acid is firm and in fair request at round £66 per ton for the glacial quality and £36 for the 80 per cent. commercial grade.

By-products generally are in quiet demand. Pitch is slow though unchanged at about 47s. 6d. per ton, f.o.b., with creosote oil also selling in limited bulk at from 3½d. to 4d. per gallon, according to quality. Crystal carbolic acid is in moderate inquiry at 7¼d. per lb., f.o.b., with crude carbolic quoted at from 2s. 5d. to 2s. 6d. per gallon, naked. Solvent naphtha is firmer at round 1s. 3d. per gallon, at works, fair sales being made.

# Company News

Waxed Papers, Ltd.—A net loss of £5,465 is reported for the past year. Against this adverse balance £3,661 was brought forward, and £2,500 has been transferred from general reserve, leaving a credit balance of £696 to be carried forward.

Eastman Kodak of New Jersey.—The directors have declared, payable on April 1 to stockholders of record on February 28, regular dividend of 1¼ per cent. on preferred stock; regular dividend of $1.25 per share on common stock, and an extra dividend of $0.75 per share on common stock.

Tarapaca and Tocopilla Nitrate Co.—The board state that the trading report for the year 1929 was £118,783, and that it has been decided to recommend the payment of a dividend of 5 per cent. for the year, payable, if approved, immediately after the general meeting to be held in Iquique on May 5. For 1928 the gross profit was £110,070, and a dividend of 10 per cent. was paid.

Lagunas Nitrate Co.—An extraordinary general meeting is called for March 14 to consider resolutions for reducing the capital from £900,000 to £180,000 by reducing all the shares in the company's capital from £5 to £1, and upon such reduction taking effect to increase the capital to £207,500 by the creation of 27,500 new shares of £1 each ranking for dividend in all respects with the 180,000 reduced shares.

Horace Cory and Co., chemical colours manufacturers.—A profit of £4,351 is reported for 1929 (against £3,934 for 1928), to which is added £319 brought forward, and a transfer of £1,000 (against £5,000) from general reserve. No interim dividend was paid on the ordinary shares. It is now proposed to make a payment of 2½ per cent. for the year on those shares, and after allowing for the preference dividend also, the balance forward is £419. Meeting, March 4.

British Metal Corporation.—The net profit for the year ended December 31, 1929, is £195,039, against £204,452 for 1928. With £25,184 brought in, the total profit available is £220,223. Dividends at the rate of 6 per cent. per annum on the preference shares (paid less income tax) absorbed £54,000, leaving £166,223. The directors recommend placing to reserve account £50,000 (which will then amount to £550,000), against £60,000 last year, and the payment of a dividend of 10 per cent. upon the ordinary shares (less income tax), as last year, leaving to be carried forward £26,223.

# Chemical Trade Inquiries

*The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.*

Carbide of Calcium.—The Commercial Secretary, British Legation, Santiago, reports that the Chilean State Railways are calling for tenders, to be presented in Santiago by April 8, for the supply of carbide of calcium. (Reference No. B.X. 6,198.)

Chemicals, Drugs, Etc.—H.M. Consul-General at Lourenço Marques, Mozambique, reports that the Purchases Commission of the local Government Treasury is calling for tenders, to be presented in Lourenço Marques by May 15, for the supply of chemicals, drugs, dressings, chemical and laboratory apparatus for Public Health Service. (Reference No. B.X. 6,193.)

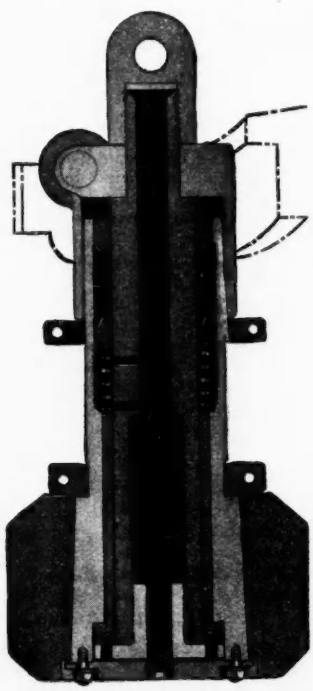
Castor Oil.—The Commercial Secretary, H.M. Legation, Bucarest, reports that the Air Inspectorate of the Ministry of the Army is calling for tenders, to be presented in Bucarest by March 21, for the supply of 75,000 kilogrammes of castor oil. (Reference No. B.X. 6219.)

## "Why Not Foreign Chemical Plant?"

The British Chemical Plant Manufacturers' Association have published as a pamphlet of 16 pages the discussion on the above question which followed their annual dinner on January 30, and which was reported in The Chemical Age of February 8. The views expressed constitute a very good case for the British plant maker. We understand that a limited number of copies are available, and application should be made to Mr. J. Davidson Pratt, the secretary, at 166, Piccadilly, London, W.1.

# Raymond

## ... Always Ahead



Sectional view of Roller Journal.
Solid black represents Lubricant.

## *The New Inverted Roller Journal*

The introduction of the new patented inverted Roller Journal marks another big step forward in Raymond efficiency.

This new Roller Journal gives many advantages, oil consumption has been reduced to a minimum, one filling of the reservoir lasting approximately a month under normal conditions.

*Recent orders for Raymond Mills include:*

1 Four Roller Mill to grind Coal, Graphite, Talc and Clay.
1 Five Roller Mill to grind Titanium Oxide Pigment.
1 Five Roller Mill to grind Iron Oxide materials.
3 Five Roller Mills to grind Coal.
1 Two Roller Mill to grind Fireclay.
1 Four Roller Mill to grind Fullers Earth.

These orders are testimony of the wide adaptability and efficient operation of Raymond Mills.

# Raymond Roller Mill

MINING & INDUSTRIAL EQUIPMENT LTD
PROPRIETORS — INTERNATIONAL COMBUSTION LIMITED
11, Southampton Row, London, W.C.1.
*Works: Derby & Erith.*

TELEPHONE:
HOLBORN 7277 (3 LINES)

TELEGRAMS & CABLES:
HARDRAYMIL, WESTCENT LONDON

# New Chemical Trade Marks

## Applications for Registration

*This list has been specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer to any inquiries relating to Patents, Trade Marks and Designs.*

*Opposition to the Registration of the following Trade Marks can be lodged up to March 12, 1930.*

"APOLLO."

504,312. Class 1. Fatty acids, sulphuric acids and oleic acid, all being chemical substances for use in manufactures. Naamlooze Vennootschap de Stearine Kaarsenfabriek "Apollo" (a Limited Liability Company organised under the laws of the Netherlands), Voorhavenkade 6 to 8, Schiedam, The Netherlands; manufacturers and merchants.—July 8, 1929. To be Associated with No. 503,475 (2,680).

"PREVENTOL."

509,239. Class 1. Chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. I.G. Farbenindustrie Aktiengesellschaft (a Joint Stock Company organised under the laws of Germany), Mainzerlandstrasse 28, Frankfort-on-Main, Germany; manufacturers.—January 3, 1930. To be associated with No. 509,240 (2,707) 1.

"INVADINE."

509,398. Class 1. Chemical substances for use as emulsifying agents and solvents, and for facilitating the wetting of fibrous materials, such as textile fibres and fabrics. Society of Chemical Industry in Basle (a Joint Stock Company organised under the laws of the Swiss Republic), 141 to 227, Klybeckstrasse, Basle, Switzerland; manufacturers and merchants.—January 10, 1930.

*Opposition to the Registration of the following Trade Marks can be lodged up to March 19, 1930.*

"DURINDONE."

509,195. Class 1. Mineral dyes. British Dyestuffs Corporation, Limited, Hexagon House, Blackley, Manchester; manufacturers.—January 2, 1930. To be Associated with No. 377,436 (2,042) iv.

"NIBREN."

509,658. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. I.G. Farbenindustrie Aktiengesellschaft (a Joint Stock Company organised under the laws of Germany), Mainzerlandstrasse 28, Frankfort-on-Main, Germany); manufacturers.—January 20, 1930.

### Xylenols and Higher Phenols from Primary Tars

IN view of the growing commercial interest in the higher boiling fractions of low-temperature tar, a study of the literature has been undertaken by E. J. Schneider and J. B. Shohan, of the U.S. Bureau of Mines, in order to obtain the fullest data regarding the properties of possible pure constituents. The investigation includes 3-ortho-xylenol, symmetrical xylenol, 2-para-xylenol, 4-xylenol, assymmetric *m*-xylenol, para-ethyl-phenol, catechol, pyro-catechol, *a*-naphthol, *b*-naphthol 2-*m*-xylenol, ortho-ethyl phenols, meta-ethyl phenols, trimethyl phenols, tetra-methyl phenols, hydroxy-ethyl-methyl benzenes, propyl and isopropyl phenols. In each case information is given respecting detection, characteristics and known derivatives. The details of the investiagtion are given in U.S. Bureau of Mines Report of Investigations 2,968.

### Potential Canadian Chemical Industries

THE possibilities of utilising more extensively the by-products of the Canadian pulp and paper industry, particularly cellulose and other Canadian chemicals was discussed in a recent address by Dr. Harold E. Hibbert, McGill University, Montreal. Attention was called particularly to the fact that 50 per cent. of the wood waste in Canada may be recovered as cellulose, which is in growing demand for use in the Celanese industry, and that ethanol can be manufactured from the large supplies of sulphite liquor available in Canada, as well as cellulose acetate for motion picture films.

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BEAU BRUMMEL (1928), LTD., London, E.C., dyers and cleaners. (M., 8/3/30.) Registered February 17, debenture, to bank; general charge. *£20,000. December 31, 1929.

NEWCASTLE-UPON-TYNE ZINC OXIDE CO., LTD. (M., 8/3/30.) Registered February 14, £5,000 debenture, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land at Sunderland, also general charge. *Nil. March 28, 1929.

### Satisfactions

BRANSTON ARTIFICIAL SILK CO., LTD., London, E.C. (M.S., 8/3/30.) Satisfaction registered February 20, all moneys, etc., registered February 5, 1930.

CO-OPERATIVE DYEING AND DRY CLEANING CO., LTD., Heckmondwike. (M.S., 8/3/30.) Satisfaction registered February 21, £1,000, registered February 10, 1908.

DAVIS AND SON DYERS LONDON, LTD. (M.S., 8/3/30.) Satisfaction registered February 18, £19,600, registered May 21, 1920.

LEVER BROTHERS, LTD., Port Sunlight, soap manufacturers. (M.S., 8/3/30.) Satisfaction registered February 21, £80,000, part of amount registered April 13, 1921.

## London Gazette, &c.

### Companies Winding Up Voluntarily

BOND AND MOFFAT, LTD. (C.W.U.V., 8/3/30.) By reason of its liabilities, February 20. J. H. Hunt, corporate accountant, 62, Dale Street, Liverpool, appointed as liquidator.

MULTI COLOR DYERS (1920), LTD. (C.W.U.V., 8/3/30.) Meeting of creditors, Grand Hotel, Aytoun Street, Manchester, Friday, March 14, at 12.30 p.m.

STANLEY BARTER, LTD. (C.W.U.V., 8/3/30.) By special resolution, February 19.

## New Companies Registered

SHERWOOD TAYLOR PRODUCTS, LTD.—Particulars were filed in February 24, pursuant to Section 344 of the Companies Act, 1929. The capital is £25,000 in £1 shares. The company was incorporated in Guernsey on November 23, 1929, to carry on the business of analytical, research and industrial chemists, druggists, drysalters, perfumers, oil and colourmen, etc., and to adopt agreements with E. W. Hanstock, F. S. Taylor and E. Myron. The British address is at 175, Piccadilly, W.1. E. W. Hanstock of 9, Lancaster Gate, W.1, is authorised to accept service of process and notices on behalf of the company. Directors: E. W. Hanstock (chairman), F. S. Taylor, Cromer Road, Holt, Norfolk, and E. C. Knight.

THEW ARNOTT AND CO., LTD.—Registered February 24. Nominal capital £6,000 in £1 shares. Shellac, gum, wax, glue and chemical merchants, manufacturers of white lac, manufacturing chemists, etc. Directors: S. A. Thew, C. E. Thew, R. J. Thew and M. Arnott. Secretary: S. H. Smith, 38, Holborn Viaduct, London, E.C.1.

### Moroccan Superphosphate Development

THE Cie de Superphosphates et Produits Chimiques du Maroc is arranging to increase the annual capacity of its Casablanca plant from 25,000 metric tons to 50,000 tons, according to a report from the U.S. Assistant Trade Commissioner in Paris. The operation of this plant dates from 1925 when it produced 15,000 tons of superphosphate. In 1928 slightly over 25,000 tons were produced, with a net profit of 1,022,294 francs.